Service Manual

ViewSonic P817

Model No. VCDTS21410-1

21" Digital Controlled Color Monitor
(20" viewable) Professional Series

(Rev. 1 - February 1999)

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Revision History

Revision	Date	Description Of Changes	Approval
1.0	2/12/99	Initial Issue	T. Sears

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SECTION 1 : SAFETY WARNING

CAUTION: No work should be attempt on an exposed monitor chassis by anyone not familiar with servicing procedures and precautions.

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SPECIFIED PARTS WHOSE PART NUMBERS APPEARS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY ViewSonic. CIRCUIT ADJUSTMENTS THAT ARE CRITICAL TO SAFE OPERATION ARE IDENTIFIED IN THIS MANUAL. FOLLOW THESE PROCEDURES WHENEVER CRITICAL COMPONENTS ARE REPLACED OR IMPROPER OPERATION IS SUSPECTED.

1.1 SAFETY CHECK-OUT:

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.

2. Check the interboard wiring to ensure that no wires are "pinched" or contact high-wattage resistors.

3. Check that all control knobs, shields, covers, ground straps, and mounding hardware have been replaced. Be absolutely certain that you have replaced all the insulators.

4. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Pint them out to the customer and recommend their replacement.

5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.

6. Check the line cord for cracks and abrasion. Recommend the replacement of any suck line cord to the customer.

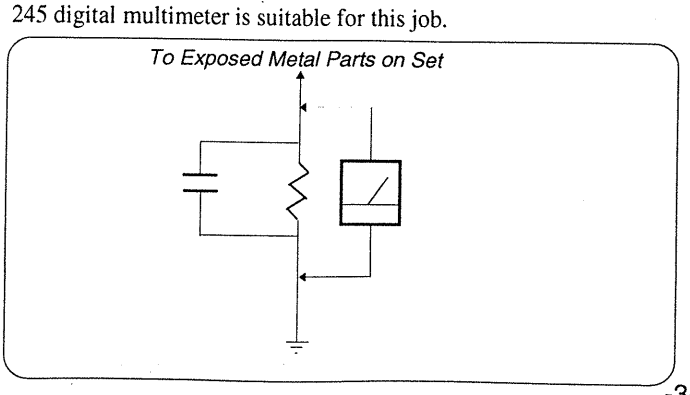
7. Check the +B and HV to see they are at the values specified. Make sure your instruments are accurate; be suspicious of your HV meter if sets always have low HV.

1.2 LEAKAGE TEST

The AC leakage from any exposed metal parts to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5mA (500 microamperes). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simoson 229 or RCA WT-540A. Follow the manufacturers' instructions to use these instruments.

2. A battery-operates AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.



1.3 HOW TO FIND A GOOD EARTH GROUND

A cold-water pipe is guaranteed earth ground ; the cover-plate retaining screw on most AC outlet boxes is also at earth ground. If the retaining screw is to be used as your earth-ground, verify that it is at ground by measuring the resistance between it and a cold-water pipe with an ohmmeter. The reading should be zero ohms. If a cold-water pipe is not accessible, connect a 60-100 watts trouble light (not a neon lamp) between the hot side of the receptacle and the retaining screw. Try both slots, if necessary, to locate the hot side of the line, the lamp should light at normal brilliance if the screw is at ground potential.

1.4 PRECAUTIONS

1.4.1 CRT REPLACEMENT

Extreme care should be used in handling the CRT as rough handling may cause it to implored due to high vacuum pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection. Be sure to disconnect the monitor from all external power sources. Discharge the CRT by shorting the anode connection to chassis ground (Not cabinet or other parts) before CRT removing. The CRT must be replace with the same type of the CRT for implosion protection and X-ray protection. Do not remove the deflection yoke and /or convergence / purity rings. The new CRT and deflection yoke are matched at the factory, which includes all required convergence / purity adjustment.

1.4.2 Power Transistor Replacement

When replacing a power transistor with heatsink. Silicone grease should be applied evenly to the transistor nuts heatsink. The transistor mounting nuts must be tight before soldering the transistor leads. These insure proper cooling and electrical connections and mechanical security. Non-compliance these instructions can result in failure of the transistor and / or relates components.

1.4.3 Component Removal

When removing a component from a circuit board, care should be taken to prevent lifting of the coil from a circuit board. An iron temperature should be controlled to the proper temperature. Apply the iron only long enough to melt the solder and draw it away.

1.4.4 X-radiation

Warning: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level <u>27.5 KV</u>.

NOTE: It is important to use an accurate periodically calibrated high voltage meter.

SECTION 2 SPECIFICATIONS

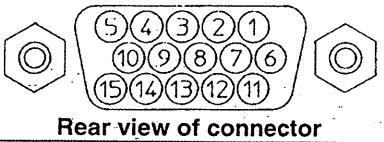
CRT	Size:	21inch	Phosphor:	Short persistence (B22)
	Dot pitch:	0.25mm	face treatment:	TCO Coat
	Total Faceplate Transmission:			TCO-Coat: 38%
Resolution	640dot x 350line to 2048dot x 1536 line			
Scanning frequency	Horizontal:	30kHz - 138 kHz		
	vertical:	50 - 180Hz		
Display size	380mm (H) x 285mm (V)			
Number of preset channels	32 channels max.			
Preset signal	Channel 1 to 11 are original preset at the factory settings.			

Preset at the factory settings

ch.	resolution	fH(kHz)	fV(Hz)	Remarks	ch.	resolution	fH(kHz)	fV(Hz)	Remarks
1	1280x1024	79.976	75.025	VESA	9	1024x768	94.500	84.997	VESA
2	1024x768	60.023	75.029	VESA	10	1152x870	68.68	75.06	MAC
3	1280x1024	91.146	85.024	VESA					
4	640x400	31.47	70.09	VESA					
5	1920x1440	112.50	75.00	VESA					
6	800x600	46.875	75.00	VESA					
7	1600x1200	93.75	75.00	VESA					
8	832x624	49.724	74.55	MAC					

Signal input	**Types of signal:**	Sync. on Green, Composite Sync., Separated Sync.
	Frequency:	30 to 138 kHz (Horizontal), 50 to 180Hz (Vertical)
	Video signal:	R,G,B analogue, 0.714Vp-p positive, Input impedance: 75 Ω
	Sync. signal:	1.0Vp-p to 5.5Vp-p positive or negative
	Connector:	15 pins mini D-sub type (by Inch screw) 5 BNC Connectors

Pin assignment (15pins mini D-sub type)



Rear view of connector

1: R	2: G	3: B	4: GND	5: GND
6: R-GND	7: G-GND	8: B-GND	9: NC	10: HS-GND
11: VS-GND	12: DDC	13: HS/VS	14: VS	15: DDC

Power	**Input voltage:**	AC90 to 132Vor AC180 to 264V
	Frequency:	50/60Hz
	Power consumption:	160W Max
Maximum Luminance output	120cd/m² TYP. (APL100%)	
Screen Distortion	Within 2mm	
Screen Linearity	Maximum 7%	
Misconvergence	Within 0.3mm (Circular area with a diameter of equal to the vertical size)	
	Within 0.4mm (Overall specified screen size)	
Maximum video Clock	360MHz	
Video Input connectors	15pin D-Type connector (R,G,B,HS,VS) and 5 BNC Connectors.	
	(Automatic selection at power on and able to change by front panel)	
National Agency Approvals	**Safety:**	IEC950 (TÜV Rheinland, (GS mark, TÜV ergonomics),UL1950, CSA C22,2 N0.950 Nordic Regulations (SEMKO)
	EMI:	FCC Class B, TÜV CE/EMC,
	ELF/VLF:	MPR-II, TCO99
USER Controls	**Luminance:**	Contrast, Brightness
	Screen Size/Position:	Horizontal Screen Size and Position, Vertical Screen size and Position.
	Screen Distortion:	Pincushion, trapezoid, Parallel, Bow Top/Bottom Pincushion.
	Screen Tilt:	Screen Tilt Adjustment
	Degauss:	Manual and Automatic Degaussing
	Color control:	Adjustable between 9300k and 6500K
	Image Control:	Moire reduction, H/V Static Convergence
Power Saving	**stand-by mode:**	Max 15W
	suspend mode:	Max 15W
	off mode:	Max 5W
Servicing Control	External communication connector (RS-232C Compatible. need communication adaptor)	
	Control software will be provided.	
Dimensions	496mm (W) x 491mm (H) x 520mm (D)	
Weight	30 kg (Approx.)	
Tilt / Swivel stand	Tilted: 12 ° (up) 5 ° (down), Swiveled: 90 ° (left) 90 ° (right)	
Ambience	Temperature: 0°C to 35°C, Humidity:20% to 80% (No dew condensation)	
Accessaries	Power Cord(PC type), VGA signal cable, User's Manual,Monitor installation file for Windows®95	

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2.2 Detailed Timing specifications of preset

Preset CH Number	1	2	3	4	5	6	7	8	9	10
Preset Name	1280x1024 75Hz	1024x768 75Hz	1280x1024 85Hz	640x400 70Hz	1920x1440 75Hz	800x600 75Hz	1600x1200 75Hz	832x624 75Hz	2048x1536 75Hz	1024x768 85Hz
Resolution (HxV)	1280x1024	1024x768	1280x1024	640x400	1920x1440	800x600	1600x1200	832x624	2048x1536	1024x768
Dot Clock (MHz)	135.000	78.750	157.500	25.175	297.000	49.5	202.50	57.283	319.915	94.500
Horizontal										
H-Freq. (kHz)	79.976	60.023	91.146	31.47	112.500	46.875	93.75	49.724	120.45	68.677
H-Total (Dots)	1688	1312	1728	800	2640	1056	2160	1152	2656	1376
H-Front porch (Dots)	16	16	64	16	144	16	64	32	64	48
H-Sync width (Dots)	144	96	160	96	224	80	192	64	216	96
H-Back porch (Dots)	248	176	224	48	352	160	304	224	328	208
H-Active (Dots)	1280	1024	1280	640	1920	800	1600	832	2048	1024
Vertical										
Vertical Freq (Hz)	75.025	75.029	85.024	70.09	75.00	75.000	75.00	74.55	75.000	84.997
V-Total (Line)	1066	800	1072	449	1500	625	1250	667	1606	808
V-Front porch (Line)	1	1	1	12	1	1	1	1	1	1
V-Sync. width (Line)	3	3	3	2	3	3	3	3	3	3
V-Back porch (Line)	38	28	44	35	56	21	46	39	66	36
V-Active (Line)	1024	768	1024	400	1440	600	1200	624	1536	768
Sync.										
H-polarity/V-polarity	POSI/POSI	POSI/POSI	POSI/POSI	NEG/POSI	NEG/POSI	POSI/POSI	POSI/POSI	NEG/NEG	POSI/POSI	POSI/POSI
Scanning mode	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER
Comment	VESA	VESA **Primary Mode**	VESA	Industry	VESA	VESA	MAC	MAC	VESA **Primary Mode**	VESA

Preset CH Number	11	12	13	14	15	16	17	18	19	20
Preset Name	1152x870 75Hz									
Resolution (HxV)	1152x870									
Dot Clock (MHz)	100.00									
Horizontal										
H-Freq. (kHz)	68.68									
H-Total (Dots)	1456									
H-Front porch (Dots)	32									
H-Sync width (Dots)	128									
H-Back porch (Dots)	144									
H-Active (Dots)	1152									
Vertical										
Vertical Freq (Hz)	75.06									
V-Total (Line)	915									
V-Front porch (Line)	3									
V-Sync. width (Line)	3									
V-Back porch (Line)	39									
V-Active (Line)	870									
Sync.										
H-polarity/V-polarity	NEG/NEG									
Scanning mode	NON INTER									
Comment	MAC									

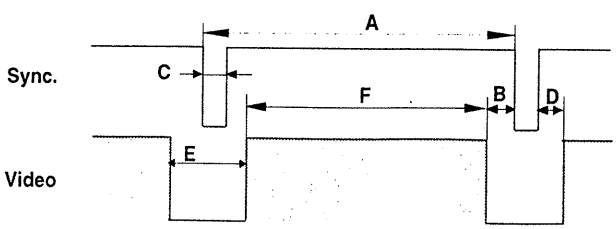

CHART DETAIL

A: TOTAL(LINE or DOTS)
B: Front porch
C: Sync pules width
D: Back porch
E: Blanking time
F: Active(LINE or DOTS)

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2.3 USB Interface Specification

1. Features

This USB Interface Device features to support of monitor function controls for size, position, geometry, luminance, colors and etc. on by Micorsoft Windows 98® OS. This function enables more user-friendly picture control on Windows PC environment. Also it provide 1- upstream for host control PC and 4-downstreams for peripheral equipments with self powered.

2. USB Device -Based on USB Standard Rev. 1.0

2-1 Data Transmission:

12Mbps at high speed, 1.5Mbps at low speed

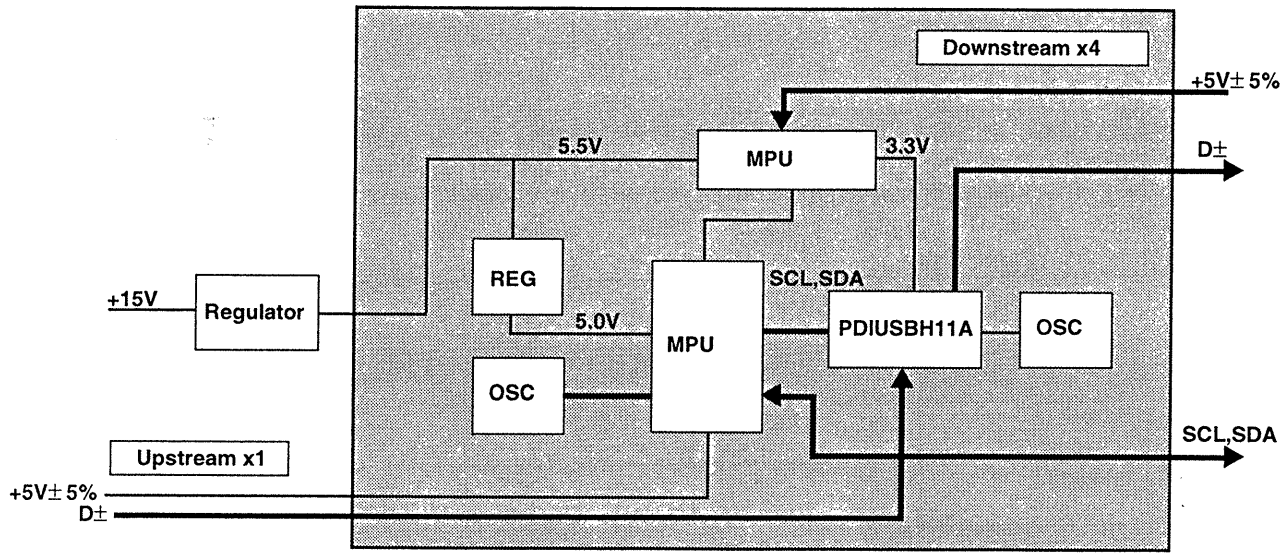
2-2 USB Port I/O:

1-Upstream for host PC, 4-Downstream for peripheral equipments.

Signal Spc: Deferential databus Input and Output signals define as below.
Recognitions as "1": (D+) -(D-) > 200mV
Recognitions as "0": (D+) -(D-) < 200mV

Power Spec: Self Powered is available for this USB.
+5V / 500mA max is avairable to each 4 downstream peripherals.
Over Current Protection is also provided to each 4 downstream peripherals.

2-3 Block Diagram



MPU: Type P83C180 (Philips)--- Rom 16kbytes, Ram 512 bytes.
USB Controller: Composite LSI type PDIUSBH11A (Philips)---Programmable.
--- external clock 12MHz ---
I/O: I^2C
Over Current Protection: UCC38531 (UNITRODE), 500mA max / each port

3.Power Save Spec

Suspend Mode: 15W max -At no connection with each upstream and downstream devices
OFF Mode: 15W max -At no connection with each upstream and downstream devices

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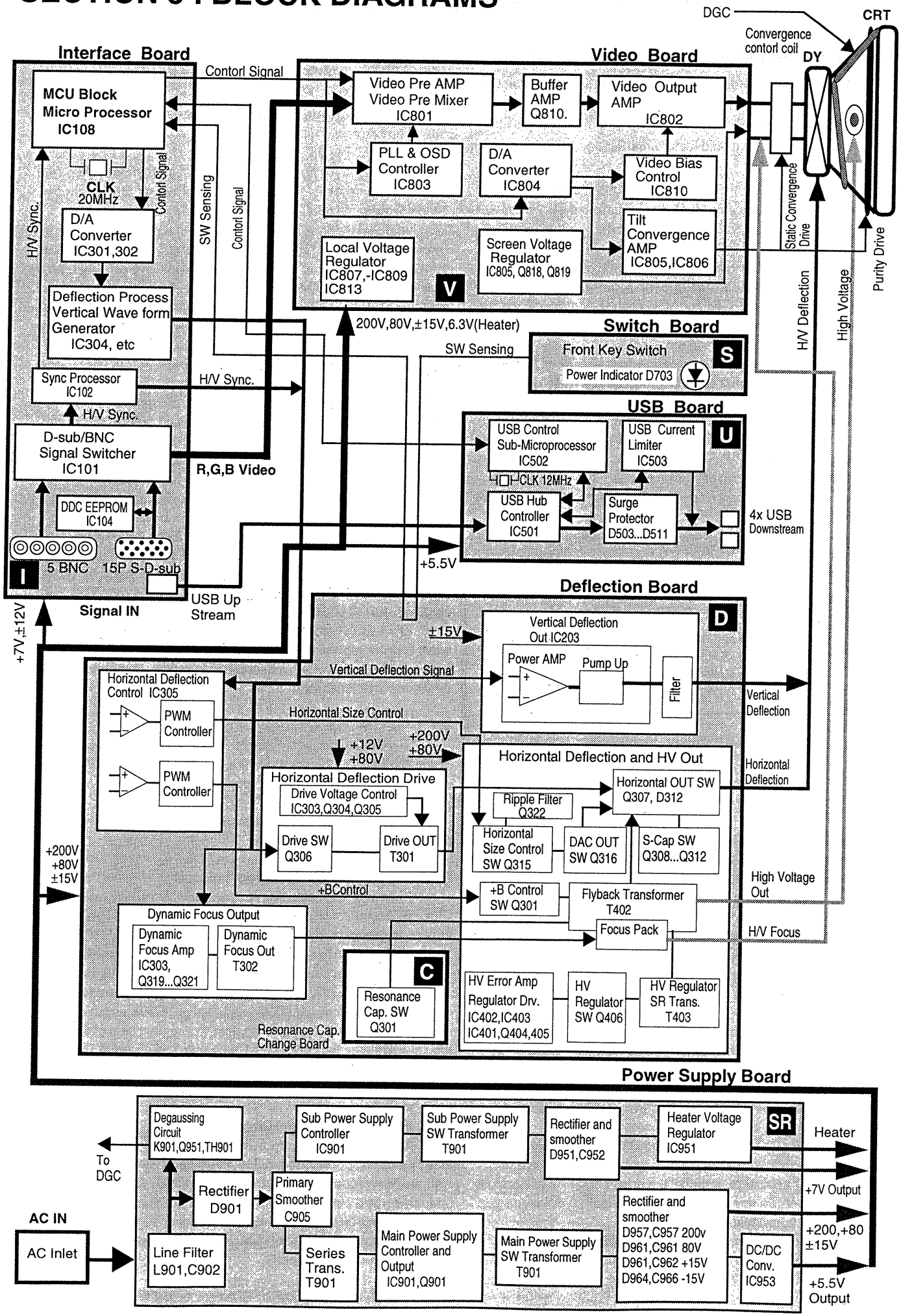
SECTION 3 : BLOCK DIAGRAMS



SECTION 4 : CIRCUIT DESCRIPTIONS

4.1 Deflection Board (M Board) Operations

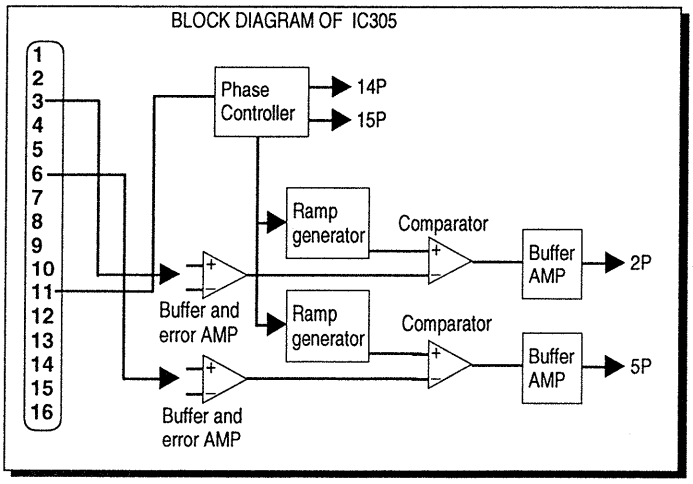
Deflection Board consists of horizontal size controller, horizontal drive and output,
Cs (S-Cap) Selection, +B (DC-DC Converter), high voltage output, vertical output circuit, Dynamic focus amplifier and focus bias circuit.

4.1.1 Horizontal Drive Control and Output circuit

Horizontal & Vertical oscillation are controlled by **IC304(μPC1883)** on Interface Board **(I Board).** The horizontal control section is consists of Sync polarity detection, Phase shifter, H-width, H-OSC, AFC, F/V control and horizontal duty control. The vertical control section is consists of Sync polarity detection, V-OSC, V-Ramp generator, V-Ramp AGC control, V-sweep correction of a vertical linearity, and E-W distortion, such as side-pin, trapezoid, pin-balance, and parallelogram.

The horizontal drive pulse generated from pin **18** of **IC304** on **I-Board** and applied to pin **7** of **P306** on **M-Board** as **H-DRV**. This drive pulse is applied to horizontal deflection control hybrid **IC (IC305)** through **11** pin of **IC305.**And horizontal +B control signal from **2** pin of **IC305 (COL-CTL)** drives **Q301** and regulate FBT +B for suitable deflection.

IC305 consists of Horizontal Drive phase controller, Horizontal flyback +B controller and Horizontal size controller. **(See block of IC305)**



Horizontal drive pulse phase control block shifts the drive pulse phase in accordance with horizontal frequency to fit with optimized drive point of horizontal output switch.

Horizontal deflection +B control block consists of an error amplifier, PWM controller and buffer amplifier. This circuit controls FBT +B in accordance with horizontal frequency.

Horizontal size control block consists of an error amplifier, **PWM** controller and buffer amplifier. This circuit controls horizontal size.

Horizontal +B voltage control pulse made by **IC305** is applied to gate of horizontal drive MOS-FET **(Q306)**. and amplified to output stage through the horizontal drive transformer **T301**. Horizontal output transistor **Q307** operates simply as a switch and this switching operation generates a saw-tooth current through the H-deflection coil.

The circuit around IC303,Q304, and Q305 are drive power control. Because of super wide range of horizontal frequency, (30 to 138kHz) it is very critical to optimize the drive condition of horizontal output transistor. So this circuit controls horizontal drive energy in accordance with horizontal frequency.

For wide range of horizontal frequency ,this monitor adopts **DAC (Double Axial Control system)** This system has conventional positive pulse switch **(Q307)** and negative pulse generator switched by **Q316.**

Because of positive and negative pulse, this system can deflect wide range of horizontal frequency in a very low power.

4.1.2 High Voltage Output and Focus Bias

The horizontal deflection and high voltage drive power supply **(+B1)** is applied MOS switching **(Q301)** This MOS FET generates adequate voltage for horizontal deflection and high voltage power supply. The horizontal and HV generate circuit of this monitor adopts **Double Axial Control system (DAC)**.So low power horizontal deflection is realized. Horizontal deflection yoke is driven by output transistor **Q307** and **MOS FET Q316**. Here, previous driver is normal type of switching circuit **(positive side switching)**, later device is NEW **DAC** system's key device **(negative side switching)**. **DAC** system has 2 main switching device of horizontal deflection. Especially negative switching device make retrace time more fast than conventional method.

To regulate **EHT**, there is voltage compensation transformer called **SR (T403)** transformer. Error voltage is detected by shunt regulator **IC402**, and converted by voltage comparator **IC408** to **PWM** pulse. Through buffer stage, **(Q404** and **Q405)**, this drive pulse is applied to gate of **MOS FET (Q406)** and drive the **SR** transformer. This compensation voltage is applied to high voltage return winding of **T402** and anode voltage is regulated.

For dynamic focus correction ,both horizontal and vertical dynamic focus correction wave generated in Interface board are applied final amplifier stage. The horizontal one consists of **IC303,Q319,Q321,Q320** and **T302,** here **T302** is step up transformer. Dynamic correction voltage which is made by **IC305** located on **I-Board** is applied to **4-pin** of **P306 (H-FOCUS)**, and applied **6-pin** of **IC303.**

The vertical one consists of **Q318**, and the control parabolic wave form is applied from **pin 5** of **P306** on **M-Board.** And the mixed parabolic wave of horizontal and vertical are applied to dynamic focus terminal of FBT.

4.1.3 Cs (S-Cap. Change) circuit

To optimize horizontal linearity, **MCU** controls horizontal S-Wave form correction capacitor **(Cs)** . **Q308** through **Q312** are **Cs** change devices. **MCU** decides appropriate capacitor and output Cs select signal.

Because of super wide range of horizontal frequency, this monitor has 5 switching device.

4.1.4 +B Converter (Chopper) circuit

Horizontal size adjusting is controlled by voltage reversing Chopper circuit consist of **Q315 ,D323** and **L307** etc. This control voltage is generated by H-control section on hybrid **IC (IC305)**. Modulated voltage is applied to gate of **Q315** (Chopper FET), and +B (DC voltage) is chopped While the on time of **Q315**, reactive energy is stored in **L307**, and while off time of **Q315**, stored reactive energy is release through **D322** , and charged **C336** as minus power source. This charged energy is applied to negative side of S-capacitors and switched by **Q316**. (**DAC** negative switch MOS FET).

Horizontal size is controlled by pulse width modulation generated in **IC305.**

4.1.5 Vertical Deflection Circuit.

The vertical drive ramp wave pulse comes from pin **9** of **IC301** on **I-Board** and applied to pin **3** of **P306** on **M-Board** as **VS-OUT** And this waveform is applied to pin **1** of **IC203. IC203** is a monolithic integrated circuit. It is a full performance and very efficient vertical deflection which intended for direct drive of vertical deflection coil, and pin **5** of this **IC** generates output saw-tooth current through the V-deflection coil.

4.1.6 Resonance Capacitor change circuit.

For stabilized operation of wide range of horizontal frequency,

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this monitor changes horizontal resonance capacitor. When low frequency, **Q301** on the **C-Board** is on then resonance capacitance value is increased and horizontal collector pulse width is more wide.

4.2 Switching Power Supply (PS Board) Operations

4.2.1 Main switching circuit

This Switching Power Supply consists of EMI filter circuit, AC rectifier and primary control, secondary rectifier, and power saving control circuit.

AC input from **P902** is rectified by **D901** through the EMI filter and smoothed by **C903**.

Inrush current is protected by the **R902,903,904** (**R903** is fusing resistor) . **IC902** is main switching controller integrated circuit. Smoothed voltage is applied to **Pin 5** of switching transformer **T903**. **IC902** is switching control IC consists of oscillation circuit, error amplifier and PWM convertor. **T902** is harmonic current reducing transformer (series transformer).

R909 and **R910** are starting circuit. When power on, rectified current is applied through upper resistors, and applied **9P** of **IC902**. and oscillation is start.

Once the oscillation starts , **IC902** drives the primary winding of **T903** and several voltage are generated secondary windings.

+B1 voltage is rectified by **D957** and smoothed by **C956,L953** and **C957**, and error voltage is detected by **IC952** (shunt regulator) and through **PH902** (Photo coupler) , which is applied to **Pin -7** of **IC902**. Error voltage is amplified and converted **PWM**, **IC901** regulates **+B1** voltage.

Main switching regulator circuit generates following 4 type of voltage Main switching regulator has also USB power supply for down

T903 No.	name	voltage	use for
	(Main Power Supply)		
10	+B1	+200V	H deflection and HV cont.
15	+B2	+80V	video ,H deflection .
16	+B3	+15V	video ,deflection control ,v-def.
17	+B4	-15V	video,deflection control. ,v-def.
	+B5	+5.5V	USB HUB Power Supply.
T901 No.	name	voltage	use for
	(Sub Power Supply)		
11	+B6	+7V	MCU control, interface

4.2.2 Sub switching circuit

To control power management state , this monitor has sub switching regulator.

Smoothed voltage is applied sub switching transformer **T901** and control **IC (IC901) IC901** is high efficiency switching IC consists of voltage detector, error amplifier, switching control circuit, and output switching MOS FET. When power is on, through **1-Pin** of **T901** primary voltage is applied to **IC901**, and oscillation is starts. Once the oscillation is started MOS FET in the **IC901** drives primary winding of **T901**, then 7 V is generated through secondary winding.

IC954 is a shunt regulator, and though **PH904**, error voltage is feed back to **IC901. then** the output voltage is regulated.

This sub power is applied to **MCU** control block on **IF** board and heater circuit.

Heater voltage is regulated by **IC951**. (with off mode sw series regulator)

4.2.3 Degaussing circuit

Magnetization of CRT is degaussed by degaussing coil controlled MCU. Degaussing circuit consists of degauss coil, positive thermistor **TH901** shutdown relay **K901** and relay drive circuit.

When the monitor is powering up, signal from **MCU (DG-CTL)** drives relay **K901**, and degaussing current is flows through degaussing coil . About 4 second later, MCU shutdowns the **K901** and degaussing current stops.

Degaussing action is operated when every powering up time and by user, by selecting degauss item from **OSD MENU.**

4.2.4 Power saving circuit

The Power saving signals which are sent from the **MCU** ,control the 2 mode of standby ,suspend (less 15W) and off (less 5W) .These 2 modes are return automatically.

The difference between standby, suspend mode and off mode is a heater voltage active or not, the first two are active but the third is nonactive. Therefore the recovery time of power off mode is equal to the normal powering on time.

But this monitor has 2 modes more, one is USB active power save mode and other is shutdown mode. Shutdown mode is protection mode which is explained section 4.5.2.

-Standby mode-

When the **PS-CTL2** signal is active (High revel active), then the **Q952** drives photo coupler **PH902** , and through **Q902** primary drive voltage of **IC902** is shut down, then main power supply stops and all of main power supply is shut down. Therefore horizontal ,vertical deflection stops and power consumption is reduced.

But on this mode, heater power of CRT is still applied by sub-power supply, then **PS-CTL2** returns inactive, monitor returns minimum time.

-Suspend mode-

Same as Standby mode operation.

-Off mode-

When **PS-CTL2** and **PS-CTL3** signals are both active, additional to upper 2mode state (main power supply shut down), IC951 is shut down by **PS_CTL3** signal. Then heater power is shut down and power consumption is minimum state less than **5W**.

Because of heater power shut down, this mode's recover time is almost normal power on time.

-USB Off mode-

Because of USB Hub function, even if H and V sync are off, it must need to supply power to USB HUB if this connection is active state.

Then in this case, **MCU** outputs **PS-CTL1** mode. This signal controls **Q956** and **Q955** OFF and **±15V** is shut down. IF **±15V** is shut down, horizontal and vertical deflection are stopped but main power supply is still active then USB power supply is still supplied to USB units.

4.2.5 Protection circuit

-Shuts down mode-

This monitor provides some protectors when circuit abnormal has happened. When internal circuit has broken and/or damaged, this monitor shuts down immediately

MCU watches +B1 over current, +B4 under voltage, and when several signal exceeds rated revel, **MCU** outputs **PS-CTL4** signal, and triggers photo thyristor **PH903**.

When **PH903** is triggered, primary control power source of **IC902** is shutdown, and oscillation stops.

Once operated this protector, monitor can not power up without power switch operation.

-CAUTION-

F901 is AC line fuse of this monitor. If blow, replace only same type and rating as follows.

Type:	**215**
Rating:	**T5AH 250V**
Mfr.:	**Littel inc.**

4.3 Video Board (V Board) Operations

Video Board (V Board) consists of video preamplifier, video output , video clamp OSD control, D/A convertor, screen tilt control

, H/V static convergence control , screen voltage regulator and CRT electrode circuit.

4.3.1 Video output, clamp and OSD circuit

Each video signal R,G,B from Interface board (**I board**) are applied to preamp of **IC801**.

IC801 has I²C interface , and through this interface, drive level of R,G,B ,and contrast are controlled .

OSD signal is mixed to each video output which are coming from **IC803,(M35045SP)**, then these mixed video signals are applied through buffer stage **Q801,Q803** and **Q805** to Output amp of **IC802 (CR6972)** and amplified about 15 times (about 23 dB). Amplified signals (output of **pin 4, 8, 12** of **IC802**) are applied to R,G, B CRT electrode.

IC801 is video bias control hybrid IC consists of high voltage DC amp. R, G, B output signals from IC 802 are cut DC level by coupling condenser C836,837,838 and are clamped specified voltage by **IC810**.

The OSD control circuit consists of **IC803 (M35045)** as a OSD control chip. This chip is controlled by the serial data from MCU. The **IC803** consists of OSD video memory and its control circuit.

IC810 is video bias control hybrid IC. This IC consists of 3 high voltage amplifier. Control signals are sent from MCU mounted on IF board and through D/A converter and **(IC804)** bias level of R,G,B are controlled.

4.3.2 D/A converter

The **MCU** controls video bias level (back ground level) ,video drive level, and contrast. Even drive revel and contrast are controlled directly by **IC801**, bias level and other items are controlled through D/A converter .**(IC804)**.

This D/A converter has 8 unit of 8-bit D/A converters . This device is 3-wire type control **(SDA,SDT,CLK)**

4.3.3 Screen tilt control circuit

The screen tilt control signal sent from **Pin-8** of **IC804**(D/A convertor) is applied to **IC805** (operational amplifier). Buffered by **Q814** and **Q815**, tilt control coil is driven, and screen tilt controlled.

4.3.4 H/V static convergence control circuit

Horizontal and vertical static control signal sent from **Pin-19** and **Pin-18** of **IC804**(D/A convertor) are applied to **IC805** and **IC806** (operational amplifier). Buffered by **Q810 , Q811, H-STA** control coil is driven, and also by **Q816** and **Q817 V-STA** control coil is driven.

4.3.5 Purity control circuit.

The purity (randing) control signal sent from **Pin-10** of **IC804**(D/A convertor) is applied to **IC805** (operational amplifier). Buffered by **Q812** and **Q813**, purity control coil is driven.

4.3.6 Screen voltage regulator

For regulate screen (G_2) voltage, this monitor has screen voltage regulate circuit.

This circuit consists of **IC805**, **Q818** and **Q819.** Middle voltage from Main board (approx 850V) is regulated about 700V.

4.4 Interface Board (I Board) Operations

Interface Board (**I Board**) consists of video input selector, sync-processor, MCU circuit block, horizontal and vertical oscillation block, horizontal distortion and size control circuit, DDC control dynamic focus wave generator and etc.

MCU (Micro Controller Unit) controls all the monitor's operation state, that are horizontal frequency, picture adjustment, white balance control, OSD control and MCU protection.

MCU circuit block consists of MCU chip, clock, EEPROM, D/A converter and their communication ports.

4.4.1 Video input selector circuit

This monitor has two video input , one is D-type subminiature connector inputs and the other is 5xBNC input. These inputs are selected by **IC101**(BH7659S). Input selection signal is controlled by MCU.

4.4.2 Sync Processing circuit

Input separate sync signals or composite sync signal or sync on green signals are shaped by the sync precessing circuit, consist of **IC102** etc. Separated or shaped signals (HD and VD) are applied to the **MCU** and H/V processing IC **(IC304:uPC1883)** and clamp pulse generating circuit.

4.4.3 MCU Block circuit.

The MCU is 16 Bit micro-controller which has 48kB of ROM and 1kB of RAM and operates 20MHz clock speed.
IC109(AT2564N)is a EEPROM which has 8k Bytes (64k bits) capacity. This chip contains adjustment data, MCU operation data and OSD data. **IC301** and **IC302** (M62352) are D/A converter -Digital to Analogue which bit width is 8 bits of adjust screen rates.

By the input of H-sync and V-sync from input connectors, the MCU detects the input signal timing mode and outputs the stored data in EEPROM to the D/A converter and several control data (i.e. Cs, horizontal frequency control, OSD control etc.) to external ports or internal control section.

When the adjustment mode, the MCU controls the picture screen data and stores these data to EEPROM.

This MCU has a external serial communication port (**P103** on the IF board) which based on RS-232C (but signal level is 0 to 5V). Using this port, MCU communicates external host computer and controls several functions. The port is used for automatic picture screen adjustments and the other service adjustments.

4.4.4 Horizontal size and Distortion control circuit

The circuit around **IC304** are horizontal synchronization ,horizontal distortion control , vertical size and linearity control circuit. This circuit generates horizontal drive pulse , horizontal distortion correction signal , and vertical ramp generator.

This monitor provides several distortion adjustment functions, such as pincushion, trapezoid, parallel and bow. These original correction wave forms are generates from **pin 10** of **IC304** as a **E/W** parabolic wave , and this parabolic wave is applied & mixed to **IC305** on **M-board.** Horizontal size and distortion signal are converted to PWM pulse, by **IC305** and controls the gate of **Q315** with **H-Size** modulated pulse and adjust the each distortions.

4.4.5 H and V Focus control circuit

The circuit around **IC305**, and **IC316** are horizontal and vertical focus control section. The horizontal one uses **H-DRV2** and **HDF-PH** signals. This IC consists of analogue multiplier, and by this trigger pulse, H and V parabolic wave are generated.

This dynamic focus parabolic wave are applied to Dynamic focus amp on **M-Board.**

4.4.6 Top and Bottom hooking correction circuit.

The circuit around **IC312,313,314,315** are Top and Bottom hooking correction circuit. Independent **SAW-TOP** and SAW - **Bottom** correction wave are applied **Pin-AMP** and **BOW-AMP** of **IC304**.

4.5 USB control Board

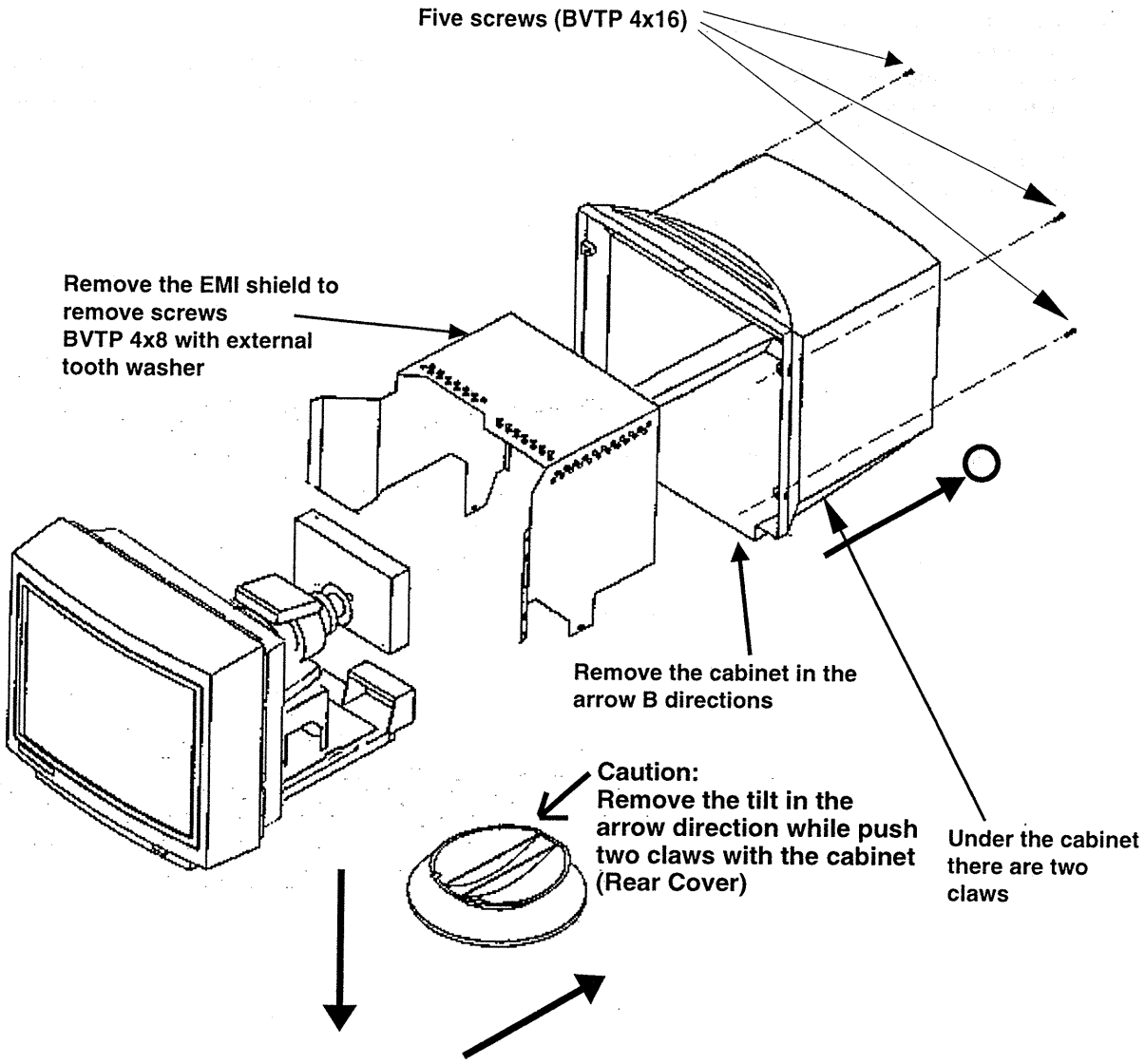
This monitor has 1 up stream and 4 down stream USB HUB function with monitor control.

IC502 located U-Board is USB control microprocessor which communicate USB HUB driver (IC501:PDIUSBH11ANB) and monitor control micro controller IC108 on the I-Board.

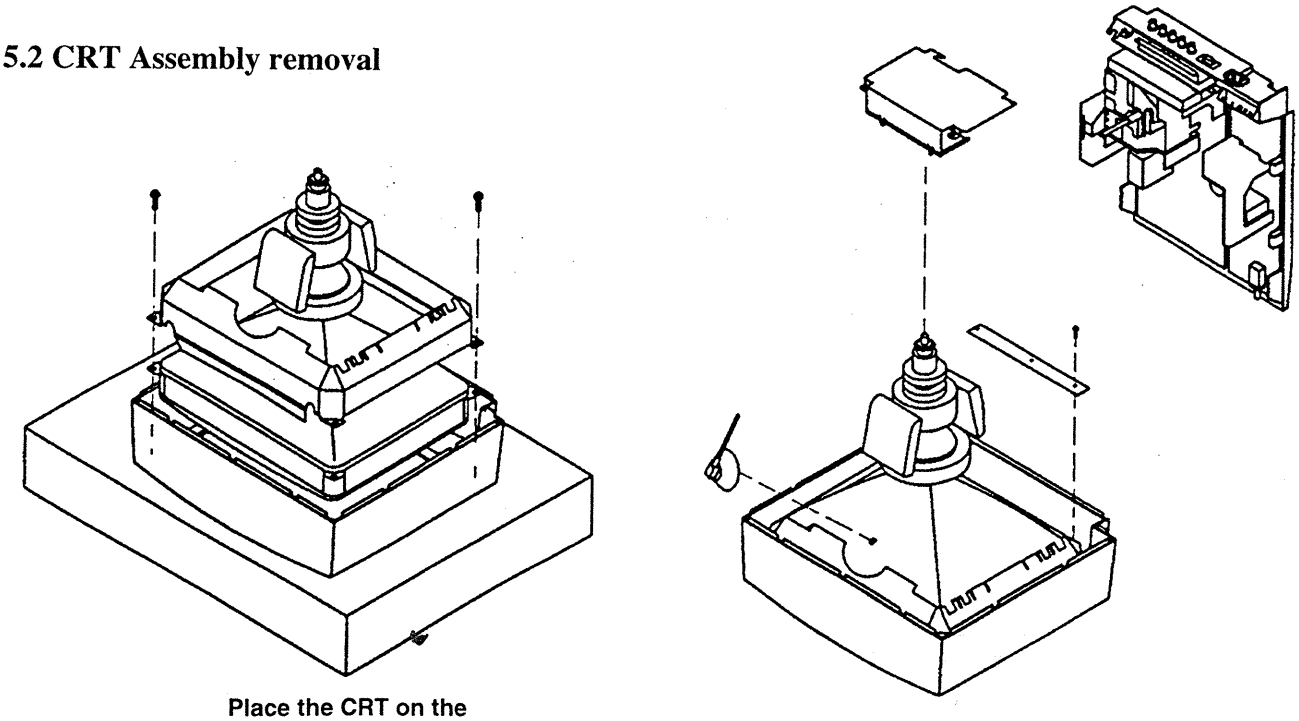
IC503 is a current limiter for USB down stream HUB power source. IF supplied current for USB peripherals connected USB down stream port has exceed rated value (0.5A/HUB), the shut down power source and inform host PC through USB ports.

SECTION 5: DISASSEMBLY

5.1 Tilt and cabinet removal


Five screws (BVTP 4x16)
Remove the EMI shield to remove screws BVTP 4x8 with external tooth washer
Remove the cabinet in the arrow B directions
Caution:
Remove the tilt in the arrow direction while push two claws with the cabinet (Rear Cover)
Under the cabinet there are two claws

5.2 CRT Assembly removal



Place the CRT on the cushion mat.

SECTION 6 SERVICE SOFTWARE

6.1 Operating environment

To operate this servicing software , following PC and instrument environment are needed.

***HV METER**
***IBM-PC or compatible machines.**
***Windows® 95 or later.**
***RS-232C (CH1, or CH2).**
***Communication unit (Monitor to Host PC).**
***Signal generator (With clock of at least 250MHz).**
***MCP-IF4 (Monitor Control Program IF4) version 1.0 or later.**
***Power supply +2.5V~6V**
***Digital VOLT METER.**
***CRT COLOR ANALYZER.**

6.2 installation

Caution: Before install the program, please make back-up copy of the diskette. All installation instructions assume that you are working with back-up copy of the diskette.

6.2.1 Installation Procedure

a. Prepare MCP-IF4 diskette No.1 and No.2.
b. When operation Windows environment, insert the MCP-IF4 diskette No.1 in the A drive .
c.Open the MyComputer Icon and the 3.5Floppy Icon and appears following window.

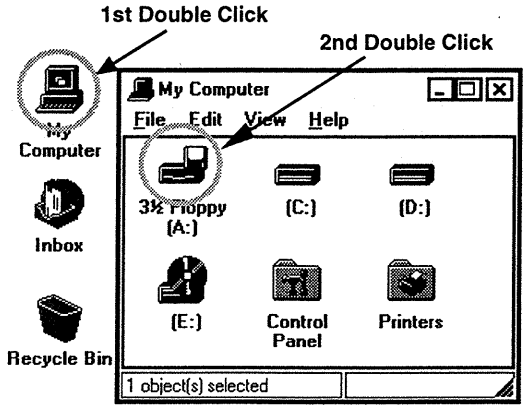


Fig 6.2.1 3½ Floppy Disk Window

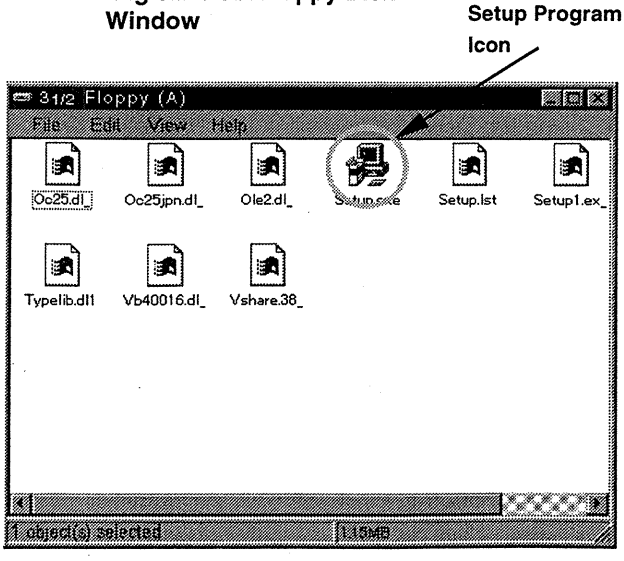


Fig 6.2.2 Files of No.1 Diskette

d. Double click the **Setup program Icon** , then setup program starts .

e. When setup program request diskette change, eject No.1 diskette and insert another one.

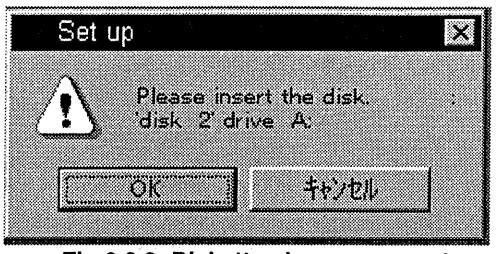


Fig 6.2.3 Diskette change request

f. When diskette loading has completed, setup program request stored place of program. (fig 6.2.3) If not specified setup program automatically store directory of C:\MCPIF4\. If store another place , please specify this place.
Click setup button, then MCP-IF4 is stored specified place. If cancel setup program, click**< Exit Setup>** button.

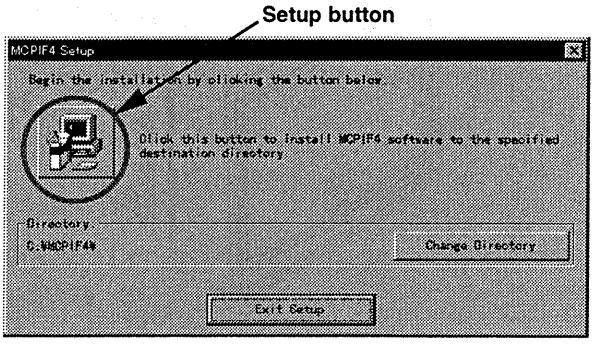


Fig 6.2.4 Setup dialog

g. When set up procedure has completed, program Icon will appear the desktop, and double click the Icon program stars.

Fig 6.2.5 Program Icon of MCP-IF4

6.2.2 Pass word

MCP-IF4 has 3 type of adjustment menu. To raise adjustment revel it needs pass words.

Caution; When the correct password is not input, the MCP-IF4 has only minimum level of menu. You will have this password from the authorized dealer.

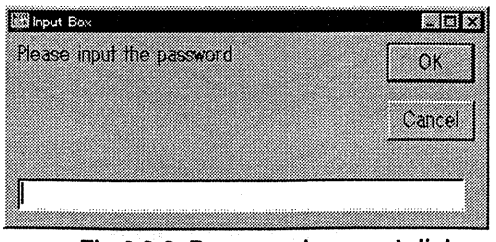


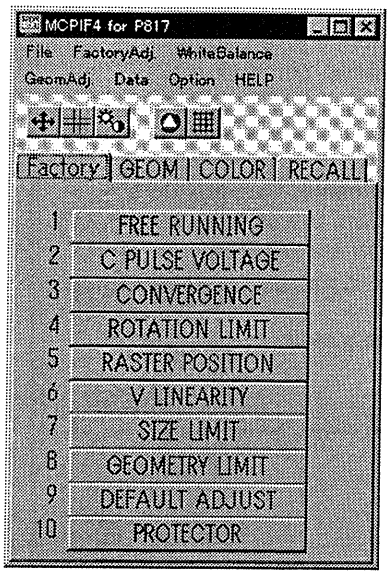
Fig 6.2.6 Pass word request dialog.

6.3 Operations

6.3.1 SQC menu

The **SQC** (sequence) menu operates sequential adjustment of the monitor. This command calls the adjustment items sequentially and should be used when the whole adjustment of the monitor are needed. (*i.e.* IF board is changed: Most of the monitor adjustment data are stored on the EEPROM of the MCU mounted on IF board.)

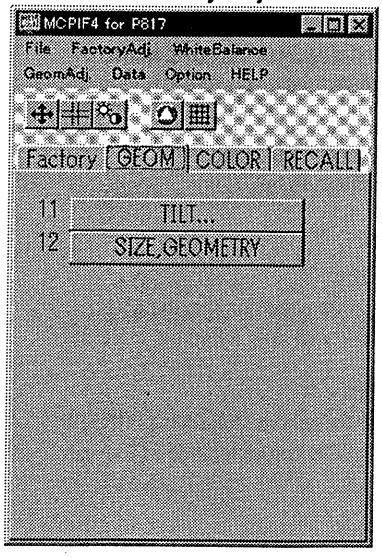
6.3.2 Factory Adjustment menu



This menu includes the items which can not adjust by front panel.

This menu should be used when factory preset timings have changed, or FBT, Interface board has changed.

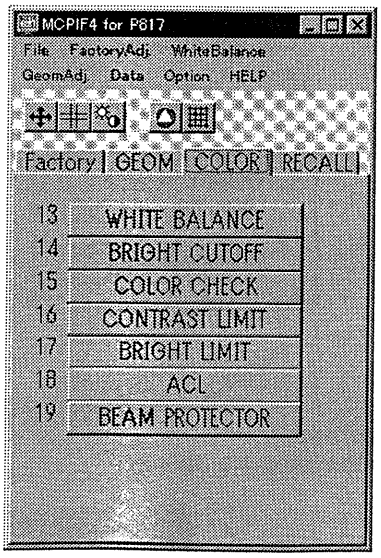
6.3.3 Geometry Adjustment menu



This menu consists of general adjustment which can adjust by front panel.

This menu can adjust factory preset CH, but front panel can only adjust user CH.

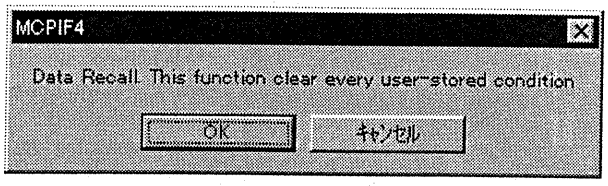
6.3.4 Color adjustment menu



This menu includes the white balance and luminance adjustment items. When the CRT or CRT board is changed, then readjust the white balance and luminance by this commands.

6.3.5 Recall menu

This command initializes user setting data. (Same as initialize operation of user access menu by front panel.)



6.3.6 File menu

This menu has monitor data filing command , firmware control command , reset command and quit command.

EEPROM data of the monitor can store and load via PC.

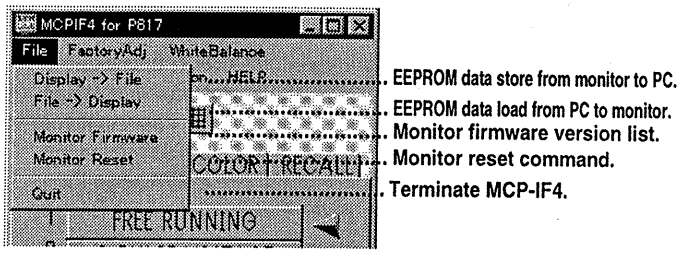


Fig 6.3.7 File menu

6.3.7 Factory adjust menu

This menu can access factory adjustment items directly. Each function of this command will be explained other section.

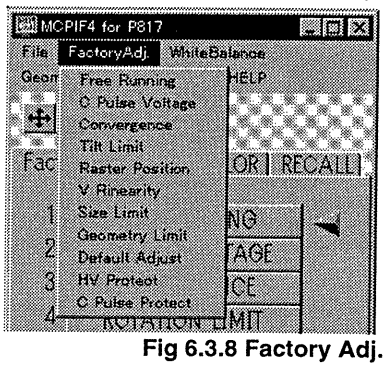
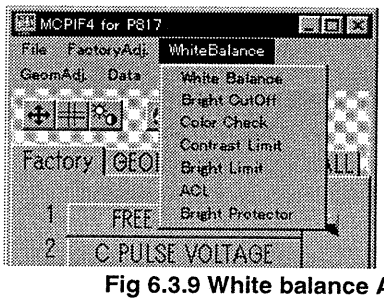


Fig 6.3.8 Factory Adj. menu

6.3.8 White Balance menu

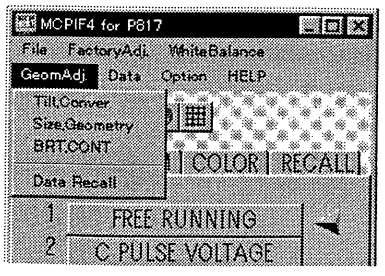


This menu can access white balance and luminance adjustment items directory.

Each function of this command will be explained other section.

Fig 6.3.9 White balance Adj. menu

6.3.9 Geometry Adjustment menu



This menu can access geometry, H/V size and position, brightness , contrast and data recall adjustment items directly.

Each function of this command will be explained other section.

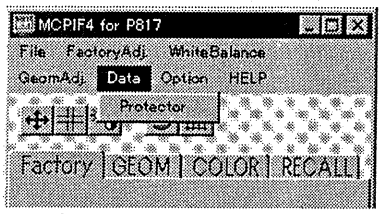
Fig 6.3.10 Geometry Adj. menu

Confidential - Do Not Copy

6.3.10 Data menu

This menu has only 1 item. This monitor has MCU protection. If circuit defect has occur, then MCU detect the defect and for safety of fire or smoke, MCU shuts down the power of this monitor.

If MCU protector triggered , then indicator of front bezel turns to red.

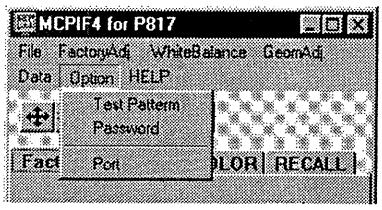


When operate this protector, via MCU we can know what is the cause of protection. Detail of explanation is later section.

Fig 6.3.11 Data menu

6.3.12 Option menu

This menu are the utilities of this program. The **Test Pattern** command displays the test pattern which is selected by check-box. This command is convenient when the monitor adjustment is operated by the Host machine signal.



The **Password** command changes the menu of **MCP-IF4** when the correct password is input.

Fig 6.3.11 Option menu

6.3.13 Help

This command displays the software version of MCP-IF4. Command help is not usable on ver 1.0.

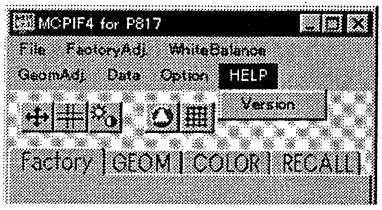


Fig 6.3.12 Help menu

6.4 Others

6.4.1 Monitor Reset

If the adjustment has been made, it is necessary to confirm the adjustment. To confirm the adjustment, the monitor reset should be done. There are two ways to reset the monitor, one way is power switch on again, other way is using the **RESET** command on the File menu. The **RESET** command is attached the command short cut button. Instead of opening the **Data - RESET** command, click the short cut button, then **RESET** command is operated. (please refer to section 6.7: Appendix)

6.4.2 Error

If the connector of communications unit is not connected properly, or the monitor power is not on, following error message is displayed.

There are no response from the monitor
Please check the connection, monitor power

EEPROM ADDRESS	Contentment
0000H ~ 0160H	Fundamental monitor operating data area (user can not access)
0180H ~ 01BFH	White balance and color data area. (white balance, user color) only user color can access.
01C0H ~ 0200H	Common adjustment data area and back up area. (Rotation, convergence, brightness, contrast, etc.)
0280H ~ 06A0H	Independent CH adjustment data area. (Signal name, size, position, distortion, H/V ch frequency data) user can access area.
0BC0H ~ 1FFFH	OSD data area

User access area
Partially user access area
Can not access area

Fig 6.4.1 EEPROM data location map

6.4.3 EEPROM data location

The monitor has 8kbyte of data memory on the MCU board. This service software accessed only adjustment element.

6.4.4 Communications Unit

The communications unit for service connects an IBM PC or compatibles and the monitor. The computer side is a D-sub 25-pin male connector.

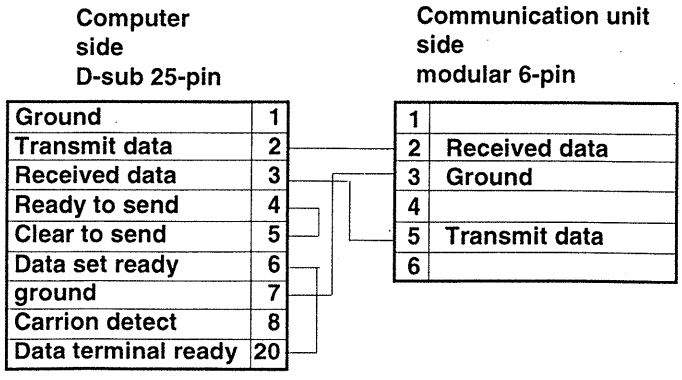


Fig 6.4.2 Communication unit connection diagram (25-pin)

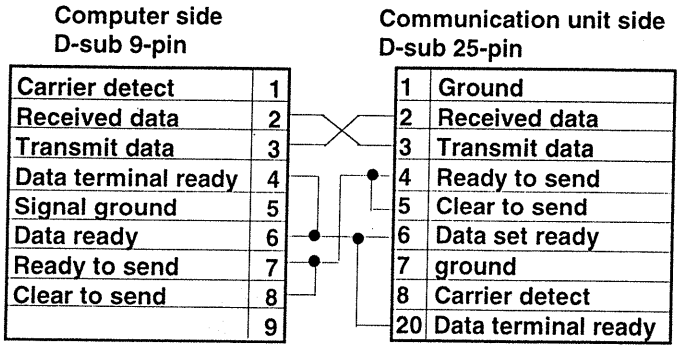


Fig 6.4.3 Communication unit connection diagram (9-pin) (Conversion Connector 25 pin to 9pin)

Depending on the computer connected, the RS-232C connector is either a D-sub 25-pin female connector or D-sub 9-pin female connector. Fig 6.4.2 and 6.4.3 show the pin layout for each connector, Please use the connector appropriate to your computer.

6.4.5 Communication Unit connection

How to connect the communication Unit

(Monitor side)

Connect the 8-pin mini-DIN connector which is located rear panel. (See below drawing)

(Computer side)

Connect the 9-P or 25-P D-sub connector to the RS-232C port. (if the port exists more than two, then connect RS232C-1 port.)

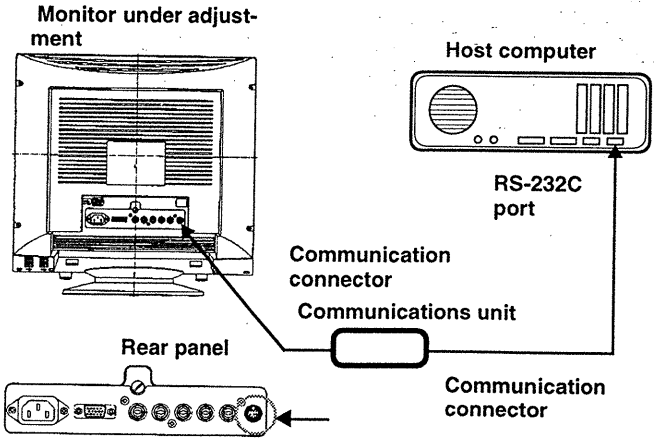


Fig 6.4.4 Communication unit connection

6.5 Safety Related Adjustment

When replacing the following components, you must make this adjustment and conformation.

FBT (PCF72-03:T402) (all adjustment is needed)
IF Board (HD,BL adjustment is needed)
R410,R409 (BL adjustment is needed)

Where HV is High Voltage, HD is HOLD-DOWN, BL is Beam Limiter.

(Adjustment condition)

1280x1024 75Hz (80KHz) CH1 Timing
No video (No screen image)

6.5.1 HV Regulator circuit adjustment and confirmation

When replacing the FBT, confirm from first step (from a. to l.). When replacing the IF board, confirm from step g to l.

Initial preparation: Connect the prove of High Voltage meter before powering on the monitor.

a. Remove the sealing cap and the **RV401** of the D board.
b. Resoldering the new parts of the **RV401**.
c. Receive specified signal.
d. Set the **BRIGHTNESS** and **CONTRAST** controls to minimum condition. (Cut-Off condition).
e. Connect the High Voltage digital meter to **Anode Cap of CRT.**
Caution :Extreme care will be needed to measure Anode Voltage.
f. Adjust this voltage for **27.5kV ± 0.1kV DC** by **RV401**.
g.Open the high voltage menu of MCP-IF4 (see fig.6.5.1), and click **<Data Set>** button. After click this button, HV protection data is set automatically.
j. After set this data, click **<Monitor Reset>** button, then this data is effective.
k. To confirm of HV HOLD-DOWN, click the **<Protector Test>** button. If the monitor goes protection mode ,then indicator of front panel turns to red.

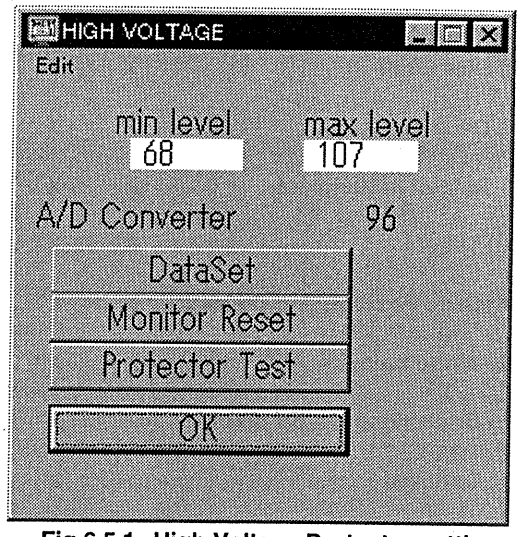


Fig 6.5.1 High Voltage Protector setting and Confirmation menu

6.5.1 Beam Current Protector adjustment

After adjust and confirm HV protection data, it needs to adjust **Beam Current** protection data.

(Adjustment condition)

1280x1024 75Hz (80KHz) CH1 Timing
All White Screen

a. Operate monitor under above condition.
b. Open Beam Current protection menu. **(fig.6.5.2)**
c. Click **<SET>** button and **<OK>** button to exit this menu.

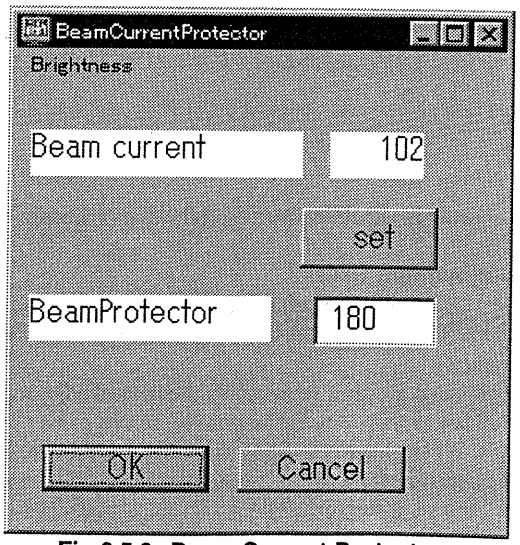


Fig 6.5.2 Beam Current Protector setting menu

6.6 Adjustment Procedure

6.6.1 Necessary adjustment for several change

If units or components on the unit has changed, following adjustments are needed.

Adjustment Item	Changed components or bloc				
	M Board	V Board	SR Board	I Board	CRT
(1) Fh adjustment				X	
(2) High voltage & HV-HOLD DOWN	X		X*1	X	X*1
(3) Convergence		X*1,*3	X*1	X*2	X
(4) Rotation (Tilt)		X*1		X	X
(5) Raster Position	X*1	X*1	X*1	X	X
(6) V Linearity	X			X	X*1
(7) Size Limit	X	X		X	X
(8) Geometry Limit	X	X		X	X*1
(9) Default adjustment	X	X*1	X*1	X	X
(10) Tilt etc	X*1	X*1	X*1	X	X*1
(11) Size, Position and Distorti	X	X*1	X*1	X	X
(12) White balance	X*1	X*1	X*1	X*2	X
(13) Brightness cut off point		X*1	X*1	X*2	X
(14) Contrast		X*1	X*1	X*2	X
(15) Bright Limit		X*1	X*1	X*2	X
(16) ACL	X*1	X*1	X*1	X	X
(17) Color CHECK					
(18) Beam Limit	X*1	X*1	X*1	X*1	X
(19) DATA RECALL					
(20) Focus	X*3				X
*Safety Related adjustment	X		X*1		X

M :Main Board
V :Video Board
SR :Switching Regulator
I :Interface Board

Comments

X means that adjustment is needed.

*1 Only confirmation is needed, but readjust if adjustment is out of range.

*2 When changed I board , if old data of MCU can readable and transfer this data to new MCU on I Board, only confirmation should be needed, but readjust if adjustment is out of range. (white balance data are transmitted to I board as digital data.)

*3 If changed FBT, this adjustments are needed.

Adjustment should be done by following procedure.

6.6.2 Adjustment Order

The order of adjustment is very important for adjustment. The order of adjustment is considered to make best adjustment.

This menu accesses sequentially the item of adjustment.

Adjustment order should be done by screen menu's order on MCP-IF4. When change the adjustment order, make sure about the other adjustment items.

6.6.3 Adjustment items

(1) Fh Adjustment (Horizontal Free running frequency)

(Adjustment condition)
31.5kHz, 125kHz, Timing

a. Select **<Free running>** menu on Factory adjustment screen.
b. Input the **31.5kHz** timing, and select **<H Free running Low>** .then appears adjustment menu. (fig6.6.2)
When select this point ,the screen horizontal synchronization has out, then adjust the screen is almost standstill by right or left arrow key.
c. When the screen almost stabilizes, click **<OK>** button to store adjustment data.

d. Input the **125kHz** timing, and select **<H Free running High>** ,then adjust as the above procedure and click **<OK>** button to store adjustment data.

Once click the **<OK>** button, the horizontal synchronization data is stored to EEPROM immediately and the screen becomes normal condition.

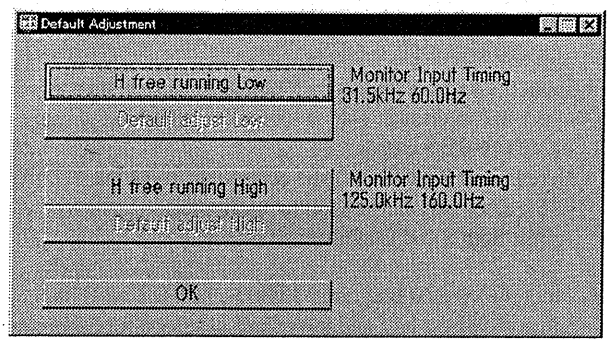


Fig 6.6.1 Fh Adjustment menu 1

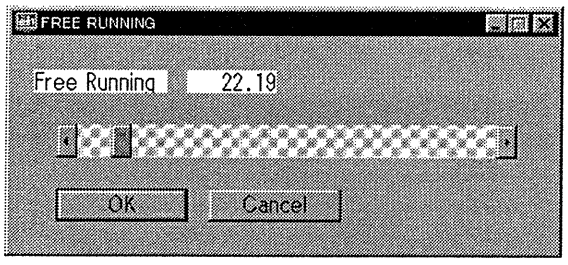


Fig 6.6.2 Fh Adjustment menu 2

**Caution: When making this adjustment, horizontal synchronization is out, so it should be needed another monitor to make this adjustment.*

(2) High Voltage adjustment & HV HOLD-DOWN Circuit Confirmation.

Please refer to Safety Related adjustment on section 6.5

(3) Collector Pulse adjustment

(Adjustment condition)

31.5kHz, 125kHz, Timing
Cross Hatch pattern
Non reverse (black background) Green
Video off

----------> *PROBING POINT See Page 26*

Adjustment voltage C Pulse Low Freq. :1110V±10V

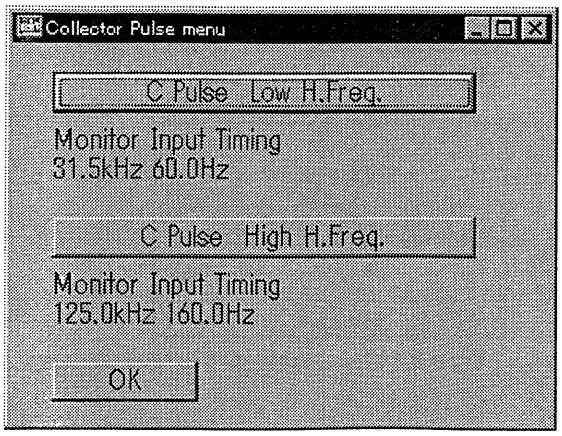


Fig 6.6.3 Collector Pulse Adjustment menu 1

Adjustment voltage C Pulse High Freq. :1110V±10V

a. Select **<C PULSE VOLTAGE>** menu on Factory adjustment screen.

b. Input the **31.5kHz** timing, and select **<C Pulse Low Freq.>** .then appears adjustment menu.**(fig6.6.4)**

c.Adjust horizontal size for specified size **(380mm)** by adjusting

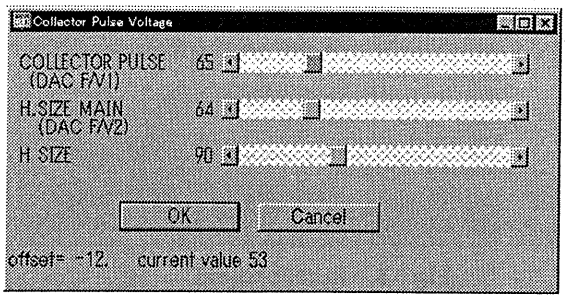


Fig 6.6.4 Collector Pulse Adjustment menu 2

H-size control or DAC F/V2.

d. Keeping above rated size, adjust collector pulse voltage for **1110V±10V** by Collector pulse adjustment bar, monitoring the collector pulse by oscilloscope or another tool (rectifier unit and voltmeter).

e. When the adjustment has complete, click **<OK>** button to store adjustment data.

f. Input the **125kHz** timing, and select **<C Pulse High Freq>** ,then adjust as the above procedure and click **<OK>** button to store adjustment data.

Adjustment voltage of **<C Pulse High Freq>** is 1200V±10V.

(4) Convergence adjustment

(Adjustment condition)

fh 80kHz
Cross Hatch pattern
Non reverse (black background) Green
Video off

a. Adjust the all **Red** and **Blue** vertical line to almost overlap each other in all of the screen by **<H Conver>** cursor.

b. Adjust the all **Red** and **Blue** horizontal line to almost overlap each other in all of the screen by **<V Conver>** cursor. After finished above a. to b. , then click **<OK>** button.

When click **<END>** button ,the convergence data is stored immediately to user area.

** To make further adjustment, please refer to appendix 1 -- Mis convergence correction -- on page 24*

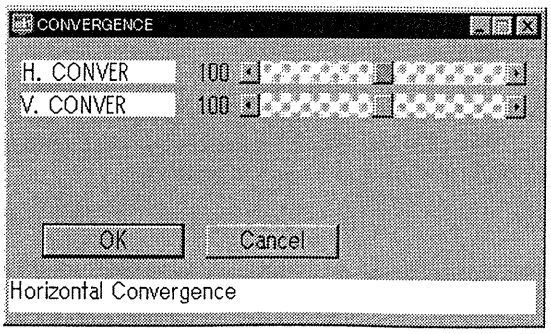


Fig 6.6.5 Convergence Adjustment menu

(5) Rotation(Tilt) adjustment

(Adjustment condition)
fh 80kHz
Cross Hatch pattern

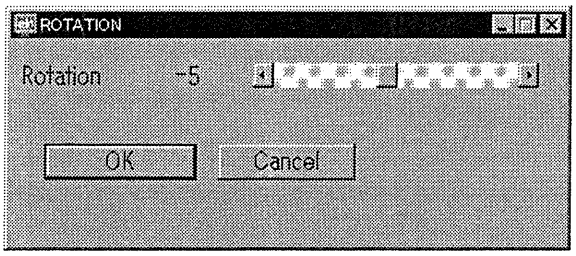


Fig 6.6.7 Rotation limit adjustment menu

a. Adjust the upper and lower line of screen image to have parallel with bezel frame line by **<ROTATION LIMIT>** adjustment.
b. After finished this adjustment, click **<END>** , then the data of **Rotation limit** is stored to **EEPROM** immediately.

(6) Raster Position
(Adjustment condition)
VGA 480L (Low),
fh 125kHz / fv 160Hz (High)
Cross Hatch pattern

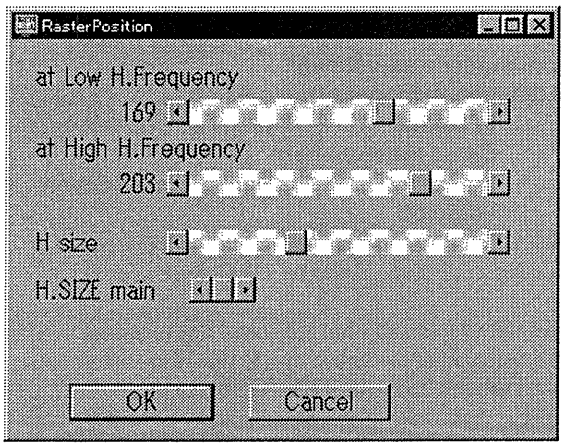


Fig 6.6.8 Raster Position Adjustment menu

a. Input the **VGA 480** line signal timing, then adjust the raster for the center position of the screen by **<Low Frequency >** bar. **NOTE1*
b. Input the **125kHz / 160Hz** mode, then adjust the raster for the center position of the screen by **<High Frequency>** cursor.

Note 1 When having <RESET>, horizontal raster position may shift right, than pre-adjusted position.

(7) Vertical Linearity adjustment
(Adjustment condition)
VGA480L timing (Low)
and 125kHz / 160Hz timing (High)
Cross Hatch pattern

**This adjustment requires only vertical VGA480L and 125kHz /160Hz timings. Horizontal timing is not specified (Horizontal timing is not concerned for this adjustment.)*

a. Input the vertical frequency **VGA480L** timing, then adjust the upper half and lower half of screen for becoming to same size by **<Fv=60Hz>** cursor.
Here Linear S means S-Type correction, and Linear C means C-Type correction. (See following figure.)
Adjust both S and C adjustment mutually.

b. Input the vertical frequency **125kHz/160Hz** timing, then adjust the upper half and lower half of screen for becoming to same size by **<Fv=160Hz>** cursor. (similar to step a.)

c. After finished above a. to b. step, click **<OK>** button. When click **<OK>** button, the vertical linearity data is stored immediately to factory data area.

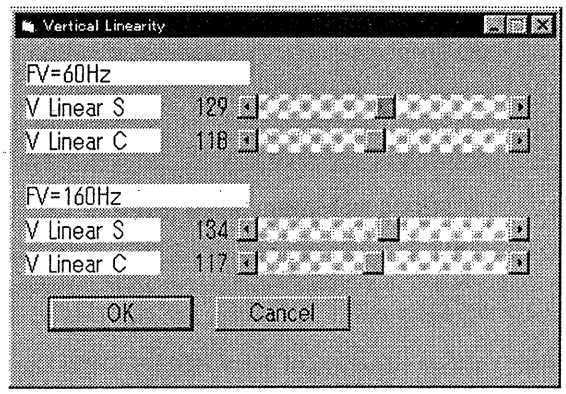


Fig 6.6.9 V Linearity Adjustment menu

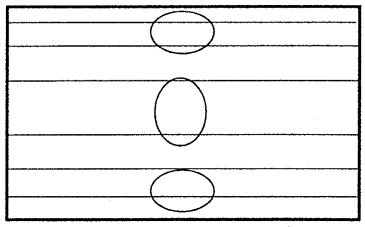


Fig 6.6.10 V Linearity S-Correction

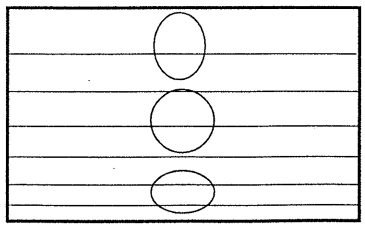


Fig 6.6.11 V Linearity C-Correction

(8) Size Limit adjustment

**This adjustment has 2 mode of menu. One is Horizontal size maximum size limit adjustment, another is Horizontal minimum size limit and Vertical maximum and minimum size limit.*

Horizontal Size Limit adjustment
(Adjustment condition)
1. VESA 1920x1440/75Hz, 2.MAC 480L
3. 125kHz/160Hz
Cross Hatch pattern

a. Select **<SIZE LIMIT>** menu on **<Factory>** adjustment tab. Then appears Horizontal and Vertical size limit adjustment menu. **(fig. 6.6.12)**

b. Input the **VESA 1920 x1440/75Hz** timing, and select **<H Size Max>** button then appears Horizontal Size Max menu. (fig. **6.6.13**)
Next step, adjust the horizontal size for almost bezel frame line by **< H.SIZE LIMIT (DAC F/V2) >** bar.
When adjustment complete, click **<OK>** button and the adjustment data is stored. (Menu returns fig.6.6.12)

c. Input the **Mac 480L** timing, then adjust the horizontal size for almost bezel frame line by **< H.SIZE LIMIT (DAC F/V2) >** bar.

d. After adjustment complete, click **<OK>** button and the adjustment data is stored.

e. Input the **125k/160Hz** timing, and adjust the horizontal size for 345mm by **< H.SIZE MIN >** bar using **fig 6.6.12** menu.
After adjustment complete, click **<OK>** button and the adjustment data is stored.

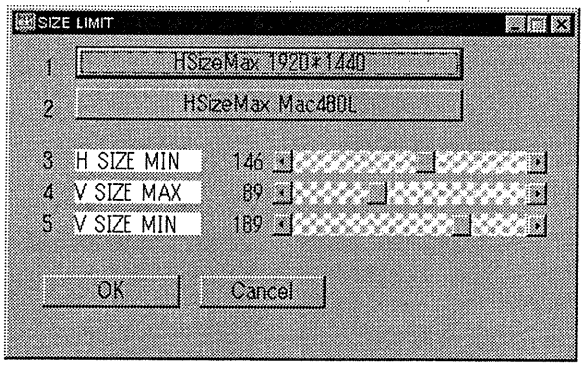


Fig 6.6.12 H Size Limit and V Size Limit Adjustment menu

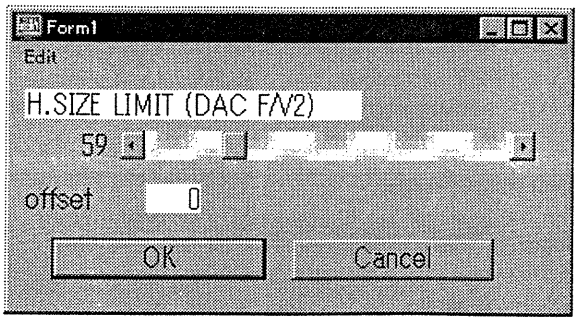


Fig 6.6.13 H- Size Limit Adjustment menu

V-size Limit adjustment
(Adjustment condition)
VGA400L
and 125kHz/160Hz timing
Cross Hatch pattern

**V-size min adjustment requires only vertical 160Hz timings. Horizontal timing is not specified (Horizontal timing is not concerned for this adjustment.)*

c. Input the **VGA 400** Line timing, then adjust the vertical size for **almost over +4mm** on bezel frame line by **<V SIZE MAX >** cursor.

d. Input the **125KHz/160Hz** timing, then adjust the vertical size for **250mm** by **<V SIZE MIN >** cursor.

d. After finished above a. to c. adjustment , then click **<OK>** button. When click **<OK>** button, the data of this adjustment is stored immediately to factory data area.

(9) Geometry Limit adjustment

(Adjustment condition)
80kHz timing (1280x1024 75Hz)
Cross Hatch pattern

a. Adjust the **H-SIZE, H-POSITION, V-SIZE, and V-POSITION, and PARALLEL** by operational keys on the front panel (adjustment using OSD) for specified horizontal and vertical size and position.

Horizontal size	**380mm**
Vertical size	**285mm**

b. After finished upper adjustment, then make best adjustment of the **<PIN CUSHION>, and <TRAPEZOID>,** by each adjusting bar.

c. After finished above a. to b. adjustment, then click **<OK>** button. When click **<OK>** button, the data of this adjustment is stored immediately to factory data area.

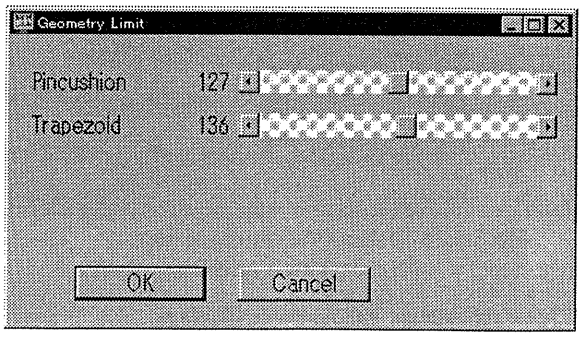


Fig 6.6.14 Geometry limit adjustment menu

(10) Default adjustment
(Adjustment condition)
VGA 480L(Low) and
125K-160Hz timing (High)
Cross Hatch pattern

For good tracking of horizontal and vertical frequency, it needs minimum to maximum frequency default adjustment.

When no-preset timing received, MCU calculates suitable correction data using this data and output to circuit.

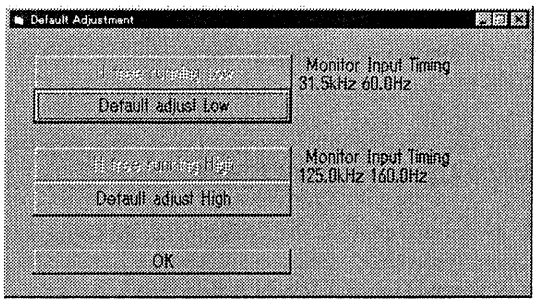


Fig 6.6.15 V Default Adjustment menu1 (Horizontal frequency change)

a. Input the VGA480L timing and Select **<Default adjust Low>**. Adjust the horizontal size and position, vertical size and position, and distortions for specified value. **(specified value -- please refer to specification section :page 4)**

b. After finished above adjustment, then click **<OK>**. When click **<OK>** button, the data of this adjustment are stored to specified data area .

c. Input the 125KHz-160Hz timing. and adjust same above.

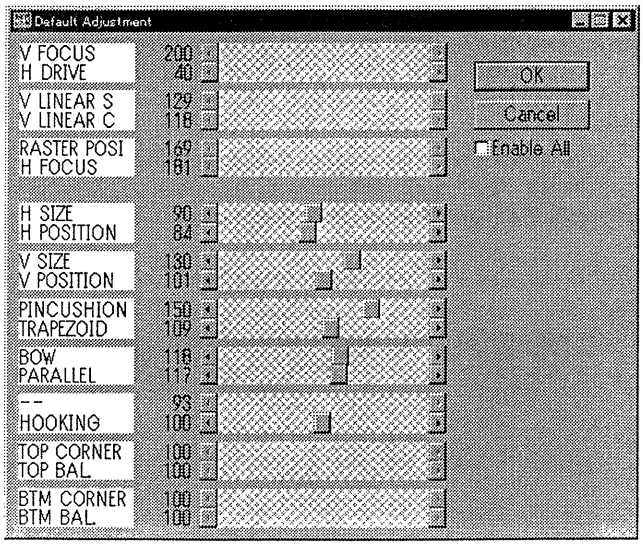


Fig 6.6.16 Default Adjustment menu2 (Size Position and Distortion)

This is adjustment for No Preset Timings.
Before adjusting this item size limit and pin limit must be completed.

* Hooking distortion adjustment corrects the right and left vertical line like a U curve. The difference between pincushion correction and hooking correction is the width of correction range. (Pincushion corrects from upper line to bottom line but cosine corrects around corner of the screen.)

Over correction optimized correction under correction

(11) Protector adjustment
(Adjustment condition)
80kHz timing (1280x1024 75Hz)
No video

This monitor has 4-type of protector. Because of high power circuit, if power component has failed, severe damage will be happened. Then MCU watches power line voltage and current, and abnormal are detected MCU shuts down main power supply immediately. These are policy of this monitor. Detail is following.

1. High voltage protector
   This protector operates when CRT high voltage is over than rated value. (DHHS regulation.)
2. +B Over current protector
   This protector operates when main power source (+B1:200V) current is over than rated value. (Almost circuit failure)
3. HV been current limiter
   This protector operates when CRT been current exceeds rating value. (Almost circuit failure)
4. Collector pulse voltage protector
   This protector operates when horizontal output transistor's collector voltage exceeds rated value. (Almost horizontal deflection circuit problem)

a. Input the 80kHz timing. (No video)
b. Click **<PROTECTOR>** button, then appears Protector Setting menu.
c. Push **<HV Protector button>** or **<C-Pulse Protector>** button.
d. Push <Data Set> button, then protection data is automatically set.
e. Push <Monitor Reset> button, then monitor resets and data is automatically loaded.
f. Confirm protector function by pushing <Protector Test> button.
g. If front bezel power indicator turns to red, then protector function is normal.

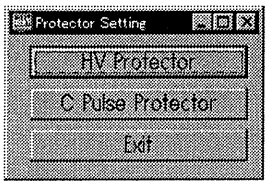


Fig 6.6.17 Protector setting menu

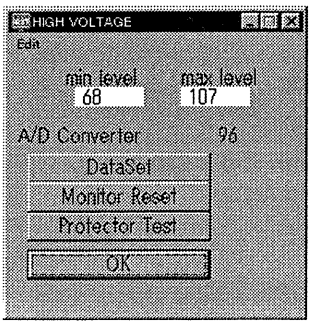


Fig 6.6.18 HV protector setting menu

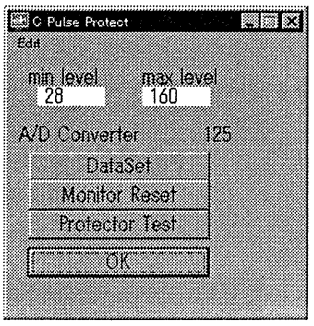


Fig 6.6.19 C-Pulse Protector setting menu

(12) Tilt , Moire, Convergence adjustment
(Preset Adjustment)
(Adjustment condition)
fh 80kHz
Cross Hatch pattern

This menu has 8 adjustment items, Tilt, Moire H/V and H/V convergence H/V dynamic focus and purity. This adjustment is equivalent to user adjustment accessed front panel. But these data are stored user area and factory area simultaneously, then if make adjustment using this menu, data are kept and can not change by initialization of front panel.

Default data is as follows.
Tilt ..... 100(Dec)
Moire H ..... 0(Dec)
Moire V..... 0(Dec)
H Convergence .. 50(Dec)
V Convergence .. 50(Dec)
H Focus ..... 100(Dec)
V Focus..... 80(Dec)
Purity ..... 0(Dec)

If some adjustment is needed, adjust these items. After adjustment click **<END>** and adjusted data are stored.

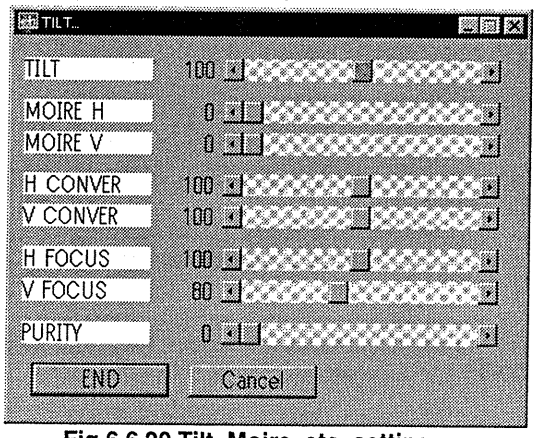


Fig 6.6.20 Tilt, Moire, etc setting menu

(13) Size , Position, and Distortion adjustment
(Preset Adjustment)
(Adjustment condition)
All preset timing
Cross Hatch pattern Distortion adjustment

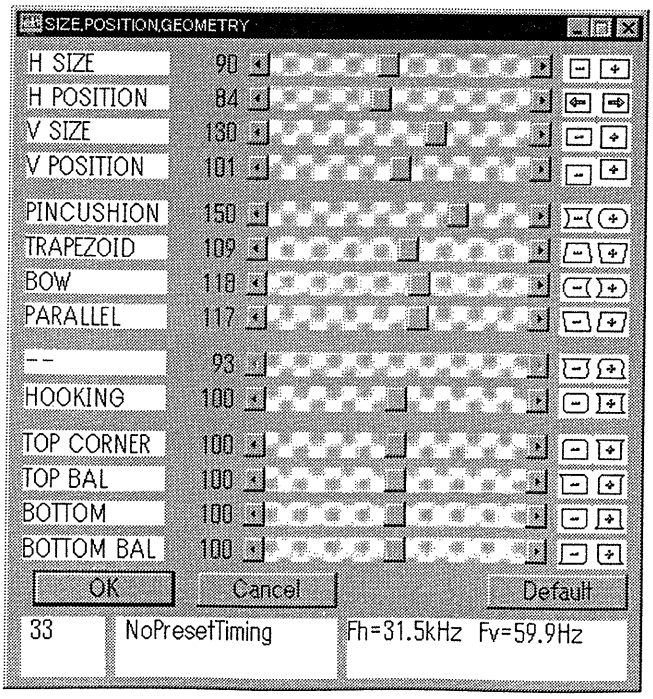


Fig 6.6.21 Preset Adjustment menu

a. Input the specified timings described on section 2.2 (page 5). , and adjust the horizontal size and position, vertical size and position, and distortions for specified value. (specified value -- please refer to specification section :page 4)

b. After finished above adjustment, then click **<OK>**. When click **<OK>** button, the data of this adjustment are stored to specified ch data area (same as user adjustment area) .

c. Change next preset timing and make same adjustment.

Before adjusting this item size limit and pin limit must be completed. Like previous adjustment, this adjusted data are stored user area and factory area. Then if operate initialize mode by front panel, these adjusted data do not change. (Same as factory data.)

(14) White balance
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
No video (No screen image)
and 20% white window screen image.

a. Adjust the back raster (back ground level) brightness and white balance to be following value under no video condition by **<BIAS MAX R>** , **<BIAS MAX G>** and **<BIAS MAX B>** cursor. The BIAS MAX data should be started with **140D**, and VIDEO +B data should be started with **96D**.

When set default R,B,G bias data to 140D, it is easy to use short cut button located right side of vide bias bar.

Back raster brightness:	**4.5 ± 0.3 cd/m²**
White balance	**X = 0.283 ± 0.01**
	Y = 0.298 ± 0.01

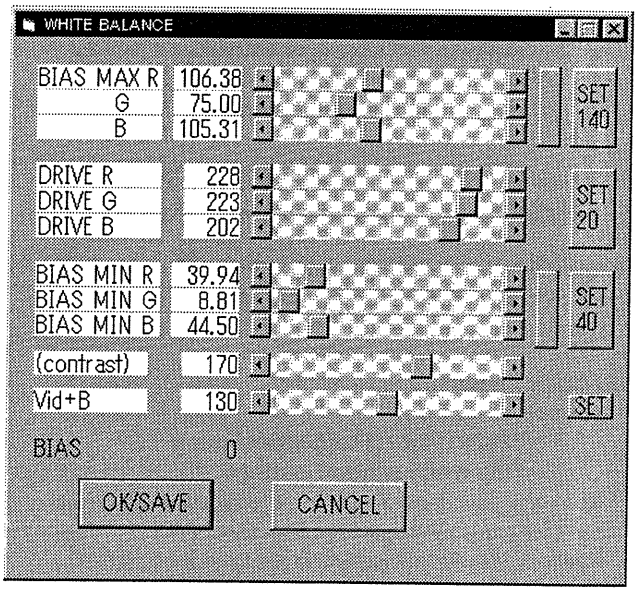


Fig 6.6.22 White balance Adjustment menu

b. Adjust the video brightness and white balance for following value under 20% window screen condition by **<DRIVE R>**, **<DRIVE G>**, **<DRIVE B>** and **<CONTRAST>** cursor. When set default R,B,G drive data to 200D, it is easy to use short cut button located right side of vide drive bar.

Video brightness:	**120 ± 3 cd/m²**
White balance	**X = 0.283 ± 0.01**
	Y = 0.298 ± 0.01

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In above adjustment, it should be fix the least color data at **200D.**

c. Adjust the video brightness and white balance to be following value under 20% white window screen image pattern by **<BIAS MIN R>**, **<BIAS MIN G>** and **<BIAS MIN B>** cursor. The BIAS MIN data should be started with **40D.**

Video brightness:	**30 ± 3 cd/m²**
White balance	**X = 0.283 ± 0.01**
	Y = 0.298 ± 0.01

Same as above adjustment ,when set default R,B,G drive data to 40D, it is easy to use short cut button located right side of vide drive bar.

d. After finished above a. to c. adjustment click **<OK>** button. When click **<OK>** button , the data of this adjustment are stored to factory color adjustment data area. (This area can not access from the front control panel)

(15) Brightness Cut off Point adjustment
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
No video (No screen image)

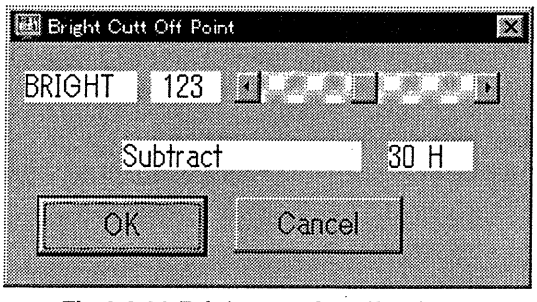


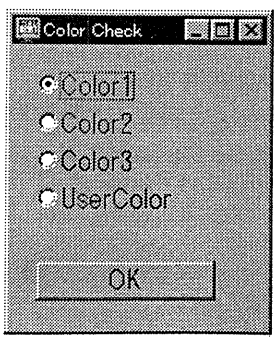
Fig 6.6.23 Brightness Cutoff Point Adjustment menu

a. Adjust the back raster brightness level from **0.2cd/m²** to **0.25cd/m²** under no video condition by **<Bright>** cursor.

b. After finished above adjustment, click **<OK>** button. When click **<OK>** button, the data of this adjustment is subtracted specified value and stored to factory data area.

(16) Color check
(Check condition)
1280x1024 75Hz (80kHz) timing
20% white window pattern

* *The color data of No.2 and No.3 are set automatically to specified value when making adjustment of No.11 (White balance), then this adjustment is not needed on normal adjustment*



a. Select preset color using this menu, and confirm white balance and brightness meet specification.

Fig 6.6.24 Color check menu

No.2 Color data

Video brightness:	**120 +10 -40 cd/m²**
White balance	**X = 0.313 ± 0.01**
	Y = 0.329 ± 0.01

No.3 Color data

Video brightness:	**120 +10 -40 cd/m²**
White balance	**X = 0.332 ± 0.01**
	Y = 0.348 ± 0.01

User Color data

White balance	**X = 0.283 ± 0.01**
	Y = 0.298 ± 0.01

(16) Contrast Limit adjustment
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
20% Window screen image

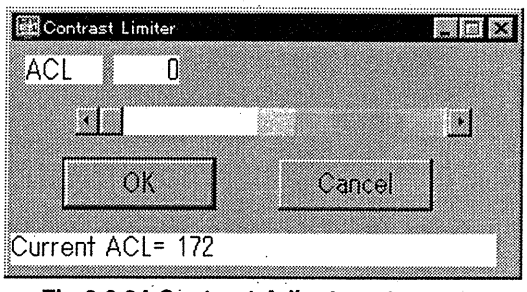


Fig 6.6.24 Contrast Adjustment menu

a. Adjust the maximum video contrast level for **120±2 cd/m²** by **<CONT MAX> cursor.**

b. Adjust the minimum video contrast level for **1±0.5 cd/m²** by **<CONT MIN>** cursor.

c. After finished above adjustment, click **<OK>** button. When click **<OK>** button, then the data of this adjustment is stored to factory data area.

Before adjusting this item (Contrast), No.13 item (Brightness Cut Off Point) must be completed.

(17) Bright Limit adjustment
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
20% Window screen image

a. Under 20% window screen, adjust the video brightness for 180±2cd/m2 by **<ATTENUATION>** cursor.

b. After finished this adjustment, click **<OK>**. When click **<OK>** button, then the data of this adjustment is stored to factory data area.

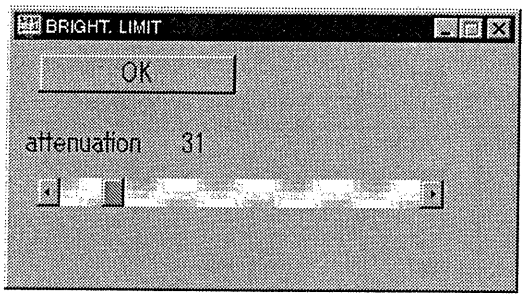


Fig 6.6.25 Brightness Limit Adjustment menu

(18) ACL (Automatic Contrast Limiter) adjustment
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
All white screen image

a. When select this menu, ACL level of the monitor is diminished and contrast and brightness are set to maximum level automatically.

b. Adjust the **ACL** level for 120±2cd/m2 by **<ACL>** cursor.

c. After finished this adjustment, click **<OK>** button. When click **<OK>** button , then the data is stored to factory data area.

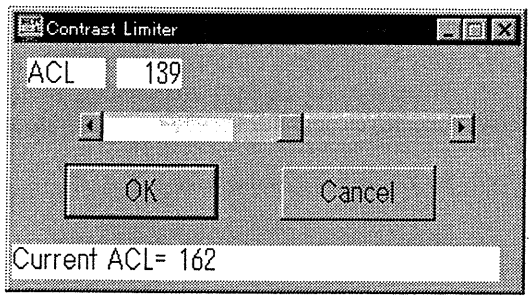


Fig 6.6.26 ACL Adjustment menu

(18) Beam Limit adjustment
Please refer to the safety related adjustment on section 6.5

(20) Focus
(Adjustment condition)
1280x1024 75Hz (80kHz) timing
Cross Hatch pattern or other specified special pattern
Contrast: MAX
Brightness Just cut off

Adjust the screen focus to be fine in all area by using the two pots located on the FBT. (Upper located pot is for horizontal line adjustment, and other one is for vertical line adjustment)

When making this adjustment, **Brightness** and **Contrast** must be set above specified condition by front operational keys.

Displayed pattern should be better to use following pattern. (mEmE pattern).This pattern can display using **option - closs-hatch** command and check the box of focus pattern.

At first using vertical line adjustment pot, adjust the vertical

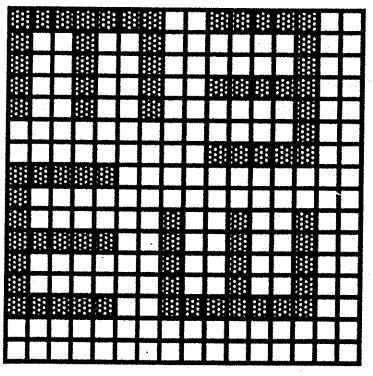


Fig 6.6.27 Focus adjustment pattern

line focus and next using horizontal line adjustment pot, adjust the horizontal line focus.

For making good focus on entire screen, **<H-FOCUS>** and **<V-FOCUS>** adjustment in a **<TILT>** adjustment menu can available.

<H-FOCUS> can adjust horizontal dynamic focus wave forum, and **<V-FOCUS>** can adjust vertical dynamic focus wave form. Fig 6.6.29 specifies variable point by dynamic focus adjustment.

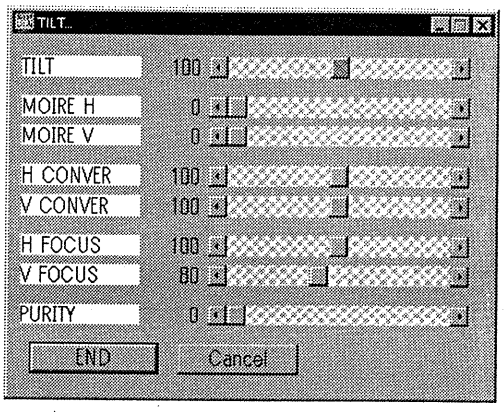


Fig 6.6.28 Dynamic Focus adjustment

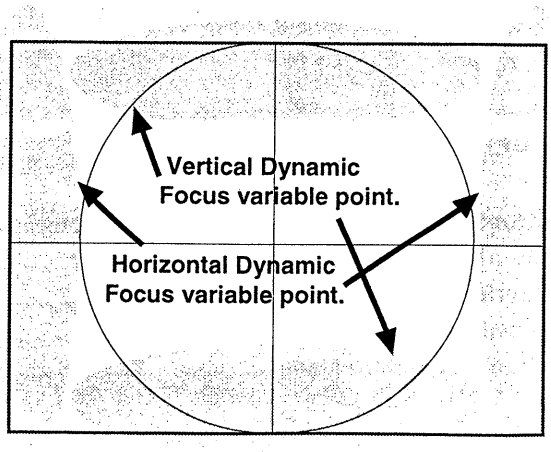


Fig 6.6.29 Focus adjustment point

6.6.4 Service TIMING

Name	CH 1 80K	FH MIN 31.5K	FH MAX 125K	MAC480L	112K 75Hz VESA75Hz	V-SIZE LIMIT				
Dot Clock (MHz)	135.00	25.16	240.0	30.24	297.0	25.18				
Horizontal										
H-Freq. (kHz)	79.976	31.47	125.00	35.00	112.5	31.47				
H-Total (Dots)	1688	800	1920	864	2640	800				
H-Front porch (Dots)	16	16	0	64	144	16				
H-Sync width (Dots)	144	96	144	64	224	96				
H-Back porch (Dots)	248	48	336	96	352	48				
H-blanking (Dots)			480	224	720					
H-Active (Dots)	1280	640	1440	640	1920	640				
Vertical										
Vertical Freq (Hz)	75.025	59.94	160.04	66.67	75.00	70.09				
V-Total (Line)	1688	525	781	525	1500	449				
V-Front porch (Line)	1	10	0	3	1	12				
V-Sync. width (Line)	3	2	3	3	3	2				
V-Back porch (Line)	38	33	35	39	56	35				
V-Blanking (Line)		45	38	45	60					
V-Active (Line)	1024	480	734	480	1440	400				
Sync.										
H-polarity/V-polarity	P/P	N/N	P/P	N/N	N/N	N/P				
Scanning mode										
Comment	VESA	VGA480	Dummy Timing			VGA400				

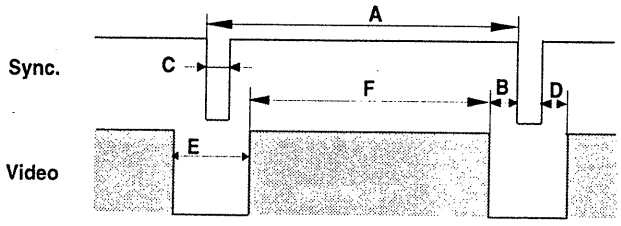


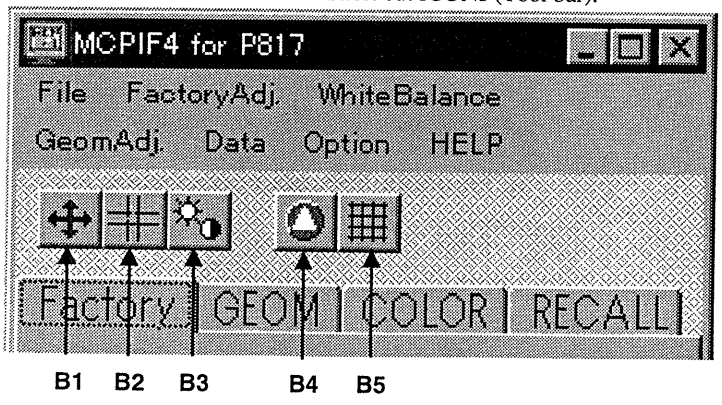
CHART DETAIL

A:	TOTAL(LINE or DOTS)	D:	Back porch
B:	Front porch	E:	Blanking time
C:	Sync pules width	F:	Active(LINE or DOTS)

6.7 APPENDIX

6.7.1 MENU Short Cut ICONs (Tool bar)

It is convenient to use Menu Short cut ICONs (Tool bar).



When you open the MCP-IF4 software, the tool bar is displayed. If you push this ICON button, then specified Item appears without selection from menu line. Each button calls the following adjusting menu.

Fig 6.7.2 ACL MENU Short Cut ICONs

B1 button Size,Position and Distortion Adjustment menu..... equivalent to \GeomAdj \ Size, Geometry menu. (No.12)
B2 button H/V Convergence Adjustment menu ..... equivalent to \FactoryAdj\ Convergence menu. (No.3)
B3 button Bright/Contrast Adjustment menu ..... equivalent to \GeomAdj\BRT,CONT menu.
B4 button Monitor Reset ..... equivalent to \File\ Monitor Reset menu.
B5 button Test Pattern menu ..... equivalent to \Option\Test-Pattern menu.

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6.7.2 Test Pattern menu

When MCP-IF4 works on a adjustment target monitor, it is very useful to display test pattern on a target monitor.

When click the <Test Pattern ICON> , following menu appears.

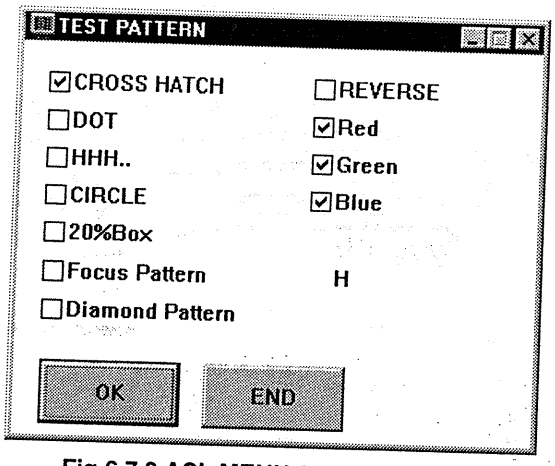

Fig 6.7.2 ACL MENU Short Cut ICONs

This pattern generate utility has 8 type of test pattern. If check the box of pattern menu, and click **<OK>**, specified test pattern is displayed whole screen. (This pattern menu disappears.)

When retrun to MCP-IF4 screen, click anypoint on the mouse, then test pattern menu is displayed, and click **<END>** button.

6.7.3 Data Filing

This monitor has 8kB (64k bits) EEPROM of data memory for adjustment data, OSD data, and monitor operating information data.

Before adjusting the monitor, it is very important to save original data (Monitor data before adjustment) to a host PC.

MCP-IF4 has filing function for store and load EEPROM data of the target monitor.

1. Saving EEPROM data

Data saving method is as follows.

a. Open the \File\Display-> File menu.

b. Data saving window is displayed. **(Fig 6.7.3)**

c. Specify file neme and click **<OK>**, then EEPROM data has saved. (Saved file name has extention .DTO) Default saving directory is \c:\mcpif4\.

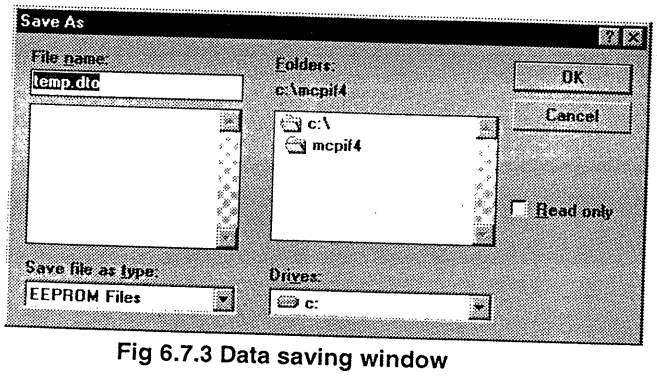

Fig 6.7.3 Data saving window

2. Loading EEPROM Data

Data loading method is as follows.

a. Open the \File\File->Display menu.

b. Data loading window is displayed. **(Fig 6.7.4)**

c. Specify file neme (extention .DTO) from saved data directory,and click **<OK>**, then data loading alert is displayed.**(Fig 6.7.5)**

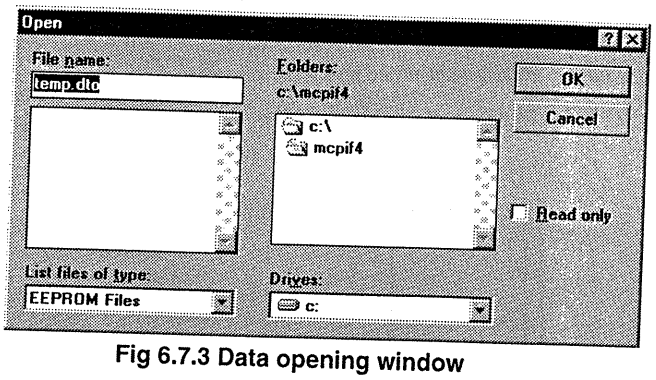

Fig 6.7.3 Data opening window

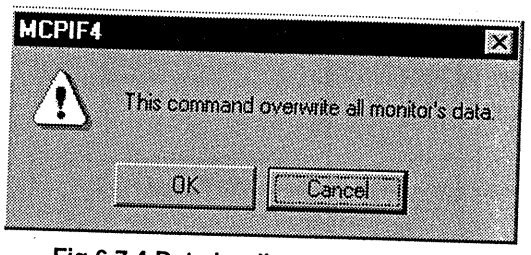

Fig 6.7.4 Data loading alert

d. After reconfirm file name, click **<OK>**, then data list window is displayed.**(Fig 6.7.6)** In this window, 3 button's function are as follows.

<End> ..... Terminate loading action without loading data.

<Write to Monitor>.. Load the specifie data to the monitor.

<Compare> ..... Compare EEPROM data with the monitor. (Data does not load.)

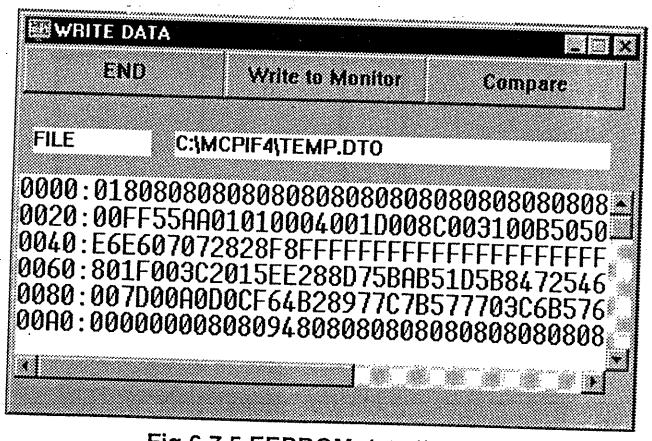

Fig 6.7.5 EEPROM data list window

Caution: EEPEOM Data Loading operation rewrites all of EEPROM Data of the monitor. If misoperation, all the data will be cleared , and monitor can not be operate even more.
We reccomend operation of EEPROM data filing, make a back up copy of EEPROM.

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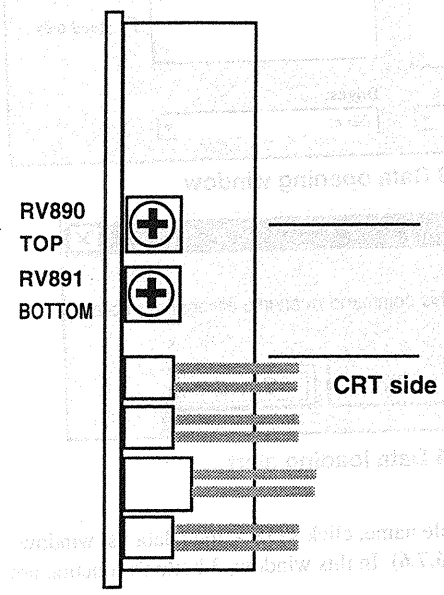
6.7.4 MIS CONVERGENCE CORRECTION

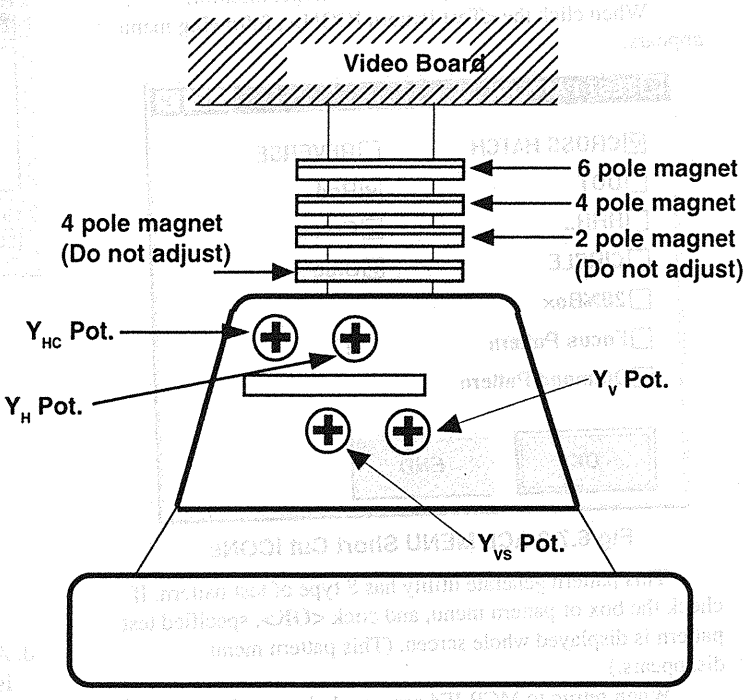
For adjust mis convergence exactly, it is needed to make adjustment around the deflection yoke.

Adjustment procedure is as follows.

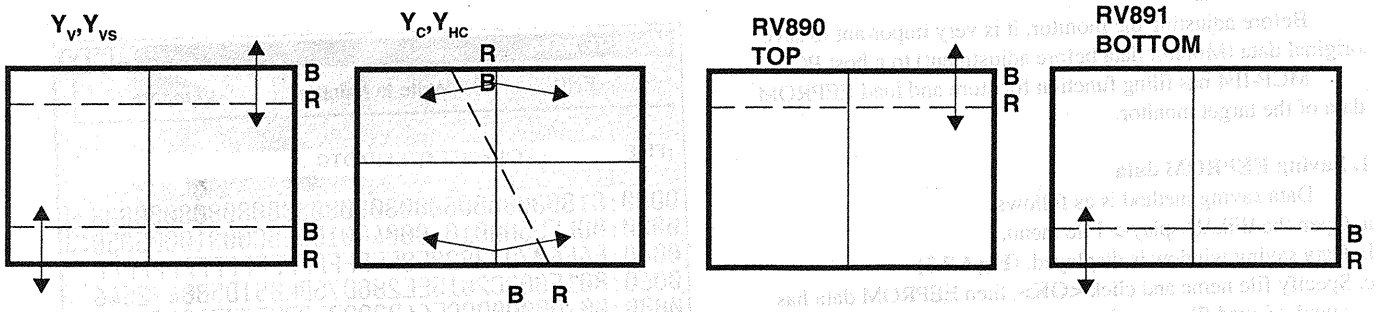


Top and Bottom mis-convergence correction pot location on the V board.

YV Pot. alignment should be adjusted with RV890 and RV891 on Video Board to reduce the trapezoidal distortion.



6 pole magnet :R,B <-> G Convergence magnet
4 pole magnet : R <-> B Convergence magnet
2 pole magnet :purity adjustment magnet (For adjust purity (Landing), it needs magnetic chamber)



6.7. 5 Collector pulse voltage measuring point

For measuring collector pulse voltage, (Refer to section 6.6.3 (3) -- collector pulse adjustment) probing point is specifie photo 6.7.1.

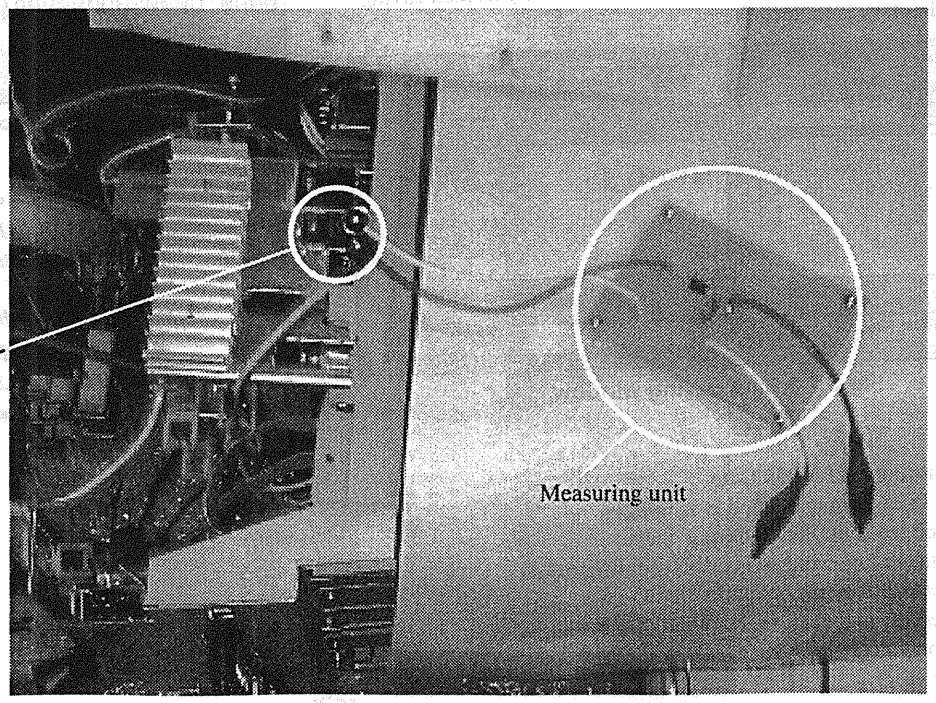


Photo 6.7.1
Collector pulse measuring point.

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SECTION 7 TROUBLE SHOOTING

7.1 Trouble Shoot

-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
1. **No image appears on the screen**	1. Absence of HV charging sound.	1. 1 **(When power supply is normal)** a. Fail of horizontal deflection circuit **(M)**	1. 1 a. Check horizontal deflection circuit components and replace if needed. (possible components) Q301 (horizontal chopper)**(M)** Q307 (horizontal output)**(M)** D312 (damper diode)**(M)** Q306 (horizontal drive)**(D)** **If Q307 has failed, it should be better to replace Q301 (Horizontal Chopper) simultaneously.*
		b. Fail of high voltage circuit **(M)**	b. check high voltage circuit components and replace if needed. (possible components) Q406 (HV compensation -output)**(M)** When change Q406,Change R401 (fusing resistor)
		c. Fail of horizontal oscillation circuit. **(I)**	c. Check horizontal oscillation circuit on **I-Board.** (possible components) IC304 **(I)** and around circuit.
		1.2 **(when power supply is abnormal)** a. Lose of line connector. b. Lose of internal connector. c. Blow of fuse, F901.	1.2 a. Check a connection. b. Check a connection of J901 . c. Replace fuse . ***caution when upper case ,other parts may be broken.**
		d. Failure of switching control component.	d. Replace IC902 (Main switching controller & output .) and IC901 (sub switch)
	2.Check of power indicator	**(When power on, indicator LED light green about one second and a moment LED light red and power down.)**	**After searching the problem, change component if needed.**
		In this case, MCU detect the failure of circuit and shutdown power supply. *This protector operates following case.* *a. High voltage is over or under.* *b. +B1 voltage is over or under.* *c. +B1 current is over.* *d. Anode current is over.* *e. Horizontal size is too large or too small.* *To confirm which case the protector operates, need the service software.*	
	2.Check of CRT electrodes		
	Heater electrode	Failure of Heater electrode.	Replace CRT
	G_2 electrode	a. G_2 (Screen voltage drop.)	a. Check D316(**M**) (G_2 rectifier) or IC805,Q818,Q819(G_2 regulator). **(V)**
	R,G,B cathode electrode	c. Failure of video circuit.	c. Check video circuit components and check the following connection especially. P801 (video signal) P802 (video control signal) **P802 is a FFC cable, special care will be needed to handle this connector.* P804 (power supply of video)

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-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
2. Poor Focus		a. Adjustment error. b. Failure of CRT *(Can not improve focus.)* Reduction of beam emission. c. Failure of FBT (Can not improve focus.) Failure of focus pot. d. Anode voltage drop or poor regulation of anode voltage. Failure of high voltage circuit.	a. Readjust focus by 2 pot. located on FBT. **(M)** b. Replace CRT. c. Replace FBT. **(M)** d. Check High voltage control circuit, and replace IC402,IC403,Q404,Q405, or Q406.**(M)**
3. Convergence			Readjust convergence by the adjustment section.
4. Dirt of color	Check of environment of monitor	a. Magnetization of chases and CRT. b. Abnormal environmental magnetic field. c. Failure of degaussing circuit. d. Short interval power ON-OFF e. CRT face direction change while power on.	a. Degauss the monitor. (automatic or manual degaussing.) b. Apart the monitor from the abnormal place and degaussing. c. Check degaussing circuit. TH901, Q951, P902 and change components if needed. d. Power on again after several minute past. e. same as d.
5. Low luminance		a. G_2 (screen)voltage drop. b. Failure of video circuit. **(V)** c. Failure of **(I)**. (video control block.) d. High voltage drop. e. Failure of CRT (reduction of beam emission)	a. Check G_2 voltage and readjust if needed using software. b. Check video circuit. IC801, IC802 (video pre/out amp) c. Check **(I)** . IC101 (analogue sw) connection of P106 (control signal from **I Board.**) d. Check high voltage control circuit. (refer to 1-b.) e. Change CRT.
6. Poor white balance		White balance adjustment error.	Readjust white balance using MCP-IF4
7. Loss of color		a. Failure of video circuit. b. Lose of connection. c. Failure of **(I)** .	a. Check video circuit. (refer to 1-2-c.) b. Check of connection. P801 (video signal and video control signal) P802 (power supply of video) c. Check of **(I)** (refer to 5-c)
8. failure of horizontal synchronization		**8.1 (When OSD message ,NO H SYNC ICON is appeared.)** a. Mis connection of video cable.	8.1 a. Confirm connection of input video signal.

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-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
8. Failure of horizontal synchronization		b. Failure of sync. processing circuit.	b. Check sync. processing circuit. IC101,102 ,IC301on **(I)** P151,152,153 **(M)**
		c. Failure of sync detection circuit on **I- Board.**	c. Check 4 pin of IC102 **(M)**
		8.2 (When OSD message is not appear.)	**8.2**
		a. Failure of horizontal oscillation circuit on **I-Board.**	a. Check horizontal oscillation circuit. IC301 (H/V oscillation) Change this component if needed.
		b. Adjustment error of horizontal free running frequency.	b. Readjust horizontal frequency using the adjustment software.
9. Failure of vertical synchro.		**9.1 (When OSD message NO V SYNC ICON is appeared.)**	**9.1**
		a. Mis connection of video cable.	a. Confirm connection of input video signal.
		b. Failure of sync. processing circuit.	b. Check sync. processing circuit. IC101,102 ,IC301on **(I)** P151,152,153 **(M)**
		c. Failure of sync detection circuit on **I- Board.**	c. Check 3 pin of IC102 **(M)**
		9.2 (When OSD message is not appear.)	**9.2**
		a. Failure of vertical oscillation circuit on **I- Board.**	a. Check vertical oscillation circuit. IC301 (H/V oscillation) Change this component if needed.
10. Failure of OSD		a. Failure of SW701 to SW706 **(S)**	a. Check of SW701 to SW706 **(S)** and connection P701 **(M)** and P153 **(M).**
		b. Failure of **I- Board.** (around sw search circuit.)	b. Check of sw search circuit. **(I)** R167 and R168 (series resistor)
		c. Failure of OSD control circuit.	c. Check of OSD control circuit. IC502 (OSD controller)(V) P501 (especially 8 to 10pin)
11. Failure of horizontal size (horizontal size is too small or too large)		a. Failure of horizontal size control circuit.	a. Check of horizontal size control circuit. IC301 **(M),** IC153(D/A converter) **(I)** P152 2pin(S-SIZE)**(M)**
		b. Failure of horizontal chopper circuit.	b. Check of horizontal chopper circuit. Q351 (H Chopper) **(M)** and control circuit (Q301 to Q306**(M).**
		c. Failure of connection of horizontal DY	c. Check of horizontal DY connection P351 (horizontal DY) **(M)**
		d. Adjustment error	d. Readjust horizontal size using MCP-IF4 or front panel.
12. Failure of vertical size (vertical size is too small or too large)		a. Failure of vertical size control circuit.	a. Check of vertical size control circuit. IC303 (vertical size control)**(I)** IC152(D/A converter)(I) 16 pin of P151

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-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
		b. Failure of vertical size output.	b. Check of V output **(M)** IC203 (vertical output) D203 (V pumping up)
12. Vertical size is too small or too large		c. Failure of connection of vertical DY	c. Check of connection of vertical P351 (H&V DY connector)
		d. Adjustment error	d. Readjust vertical size using MCP-IF4
		13.1 (When failure of horizontal raster position.)	**13.1**
		a. Failure of horizontal raster position control circuit.	a. Check of control circuit **(M)(I)** Q302 **(M)**,IC301(D/A)**(I)**
13. Horizontal position is not center		b. Failure of horizontal raster position drive circuit.	b. Check of h position out IC304 (Power OP amplifier)**(M)** D303, D304 (h posi rectifier) R307,R308 (fusing resistor)
		c. Adjustment error	c. Readjust using MCP-IF4 *(This item can only adjust by MCP-IF4)*
		13.2 (When failure of horizontal phase (video position) sifter	**13.2**
		a. Failure of phase sift control circuit.	a. Check of phase sift circuit. **(I)**
		b. Adjustment error	b. Readjust using MCP-IF4 or front panel.
		a. Failure of vertical position control circuit.	a. Check of position control circuit. **(I)** IC302 (D/A converter) 25 pin of P306**(M)**
14. Vertical position is not center.		b. Failure of vertical position output circuit.	b. Check of position output circuit. **(M)** pin7 of IC203(V-amp)
		c. Adjustment error	c. Readjust using MCP-IF4 or front panel.

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7.2 Appendix

Check of MCU protection

When the monitor is powering on, if power indicate LED lights green about 2 or 3 second and next it lights red a moment and power down , then MCU controlled protector has operated and shutdown the power supply.

As explain on circuit description section, the MCU of this monitor is searching several circuit information of monitor. These information is as follows.

1. **Horizontal size information.** **(under or over)**
2. **High Voltage information.** **(under of over)**
3. **Anode beam current information.** **(over)**
4. **+B current information.** **(over)**
5. **+B voltage information.** **(under or over)**
6. **EEPROM failure or data error**

If the sensing voltage of information has been over (or under) than setting value by something cause (*ex* failure of component), the MCU triggers the PS3 signal (SWR shutdown signal) and shutdown power supply. Before shutting down, the MCU writes the code of protection in the EEPROM.

To solve the cause of shutdown , it is needed to read this code.

If the main power supply has shut down, MCU operates by sub power supply, then even if protection mode , it can possible to access MCU and read this code.

How to know the shutdown cause.

1. Connect the communication unit and run **MCP-IF4**
2. Select **\ Data \ Protector** menu.
3. The window of Protector Data window will appear and you can know the cause of shutdown on the **Data 2.** (**Data 1** has already written when the factory protection check.)
4. When protecter operates, first time Data 1 is written, and second time Data 2 has written. But more than third time , Data 1 is not written.
   When confirmation is needed, click **<Clear>** button to clear protection data.
5. When the cause has known, repair or readjust the monitor.

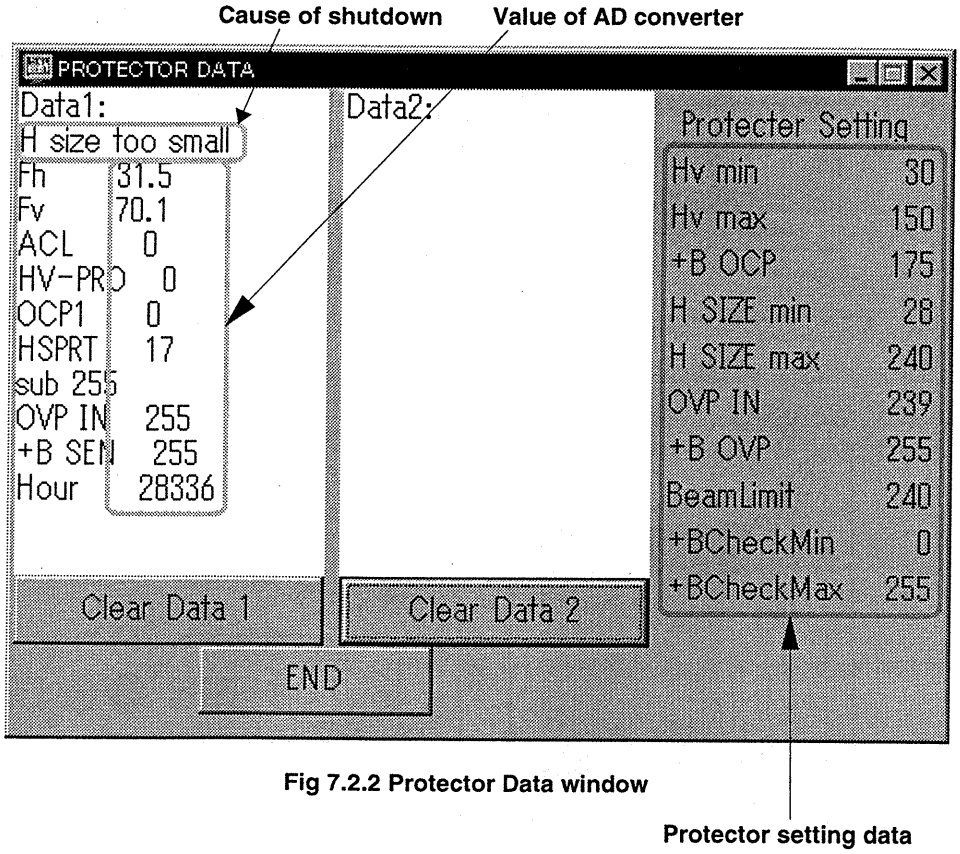
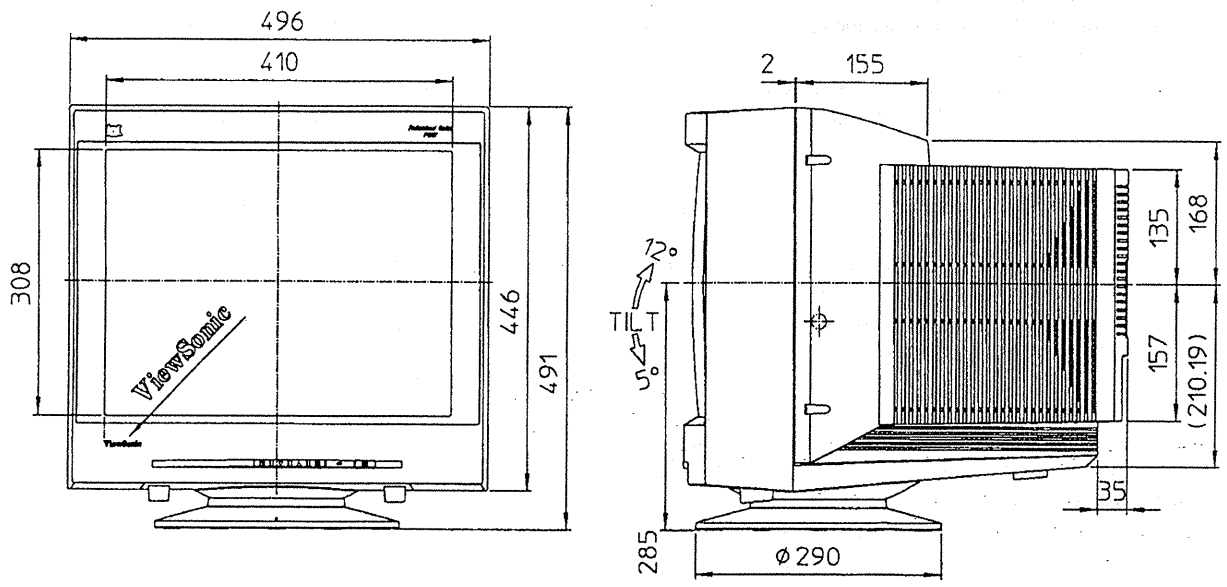
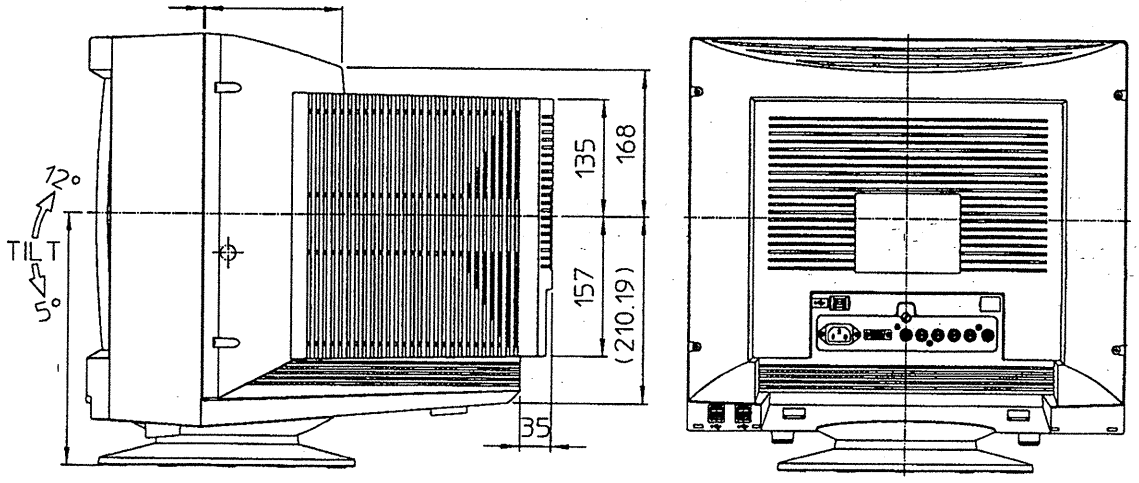


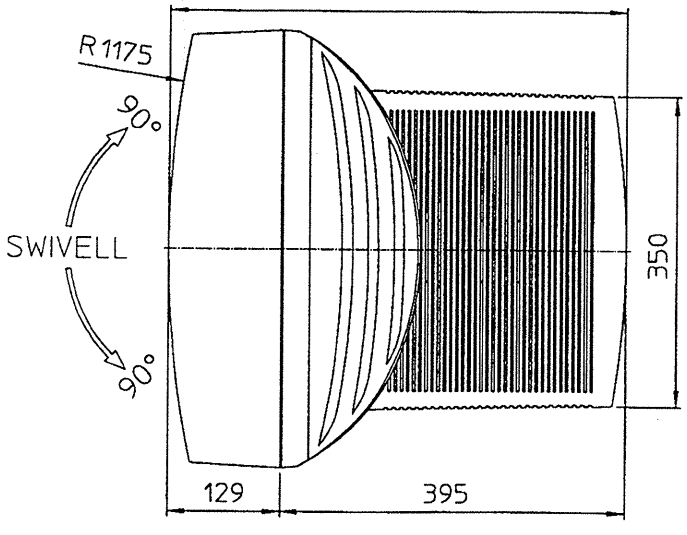
Fig 7.2.2 Protector Data window

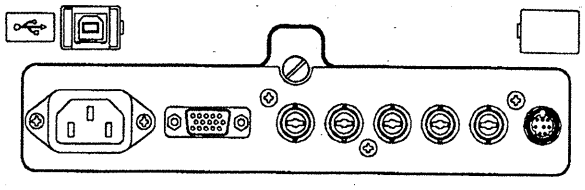
Fig 7.2.1 Jumpering point

SECTION 8 OUTLINE DRAWING









Detail of Rear Panel

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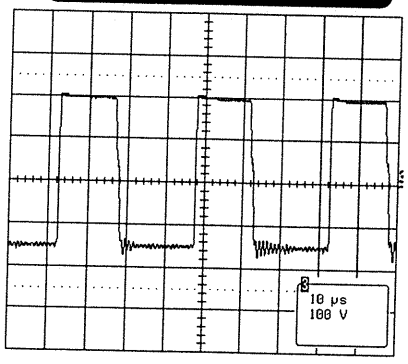
SECTION 9: WAVE FORMS

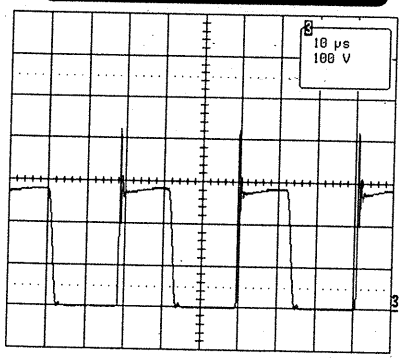
The wave forms are measured following condition.

Horizontal frequency .....: 93.00KHz
Vertical frequency ..... : 75Hz
Video mode .....:All white pattern
Luminance .....:Max
Line input .....:100V AC

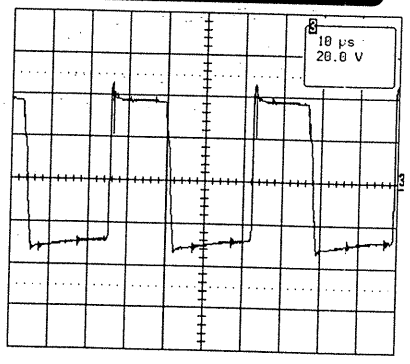
P1 +B1 SECONDARY WINDING



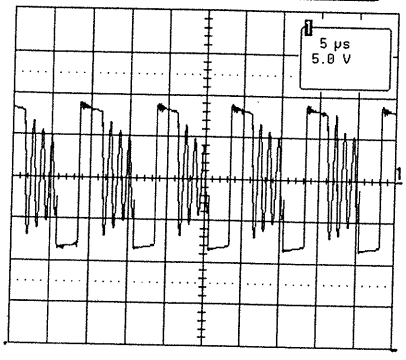
P2 T905 P-9 WINDING VOLTAGE



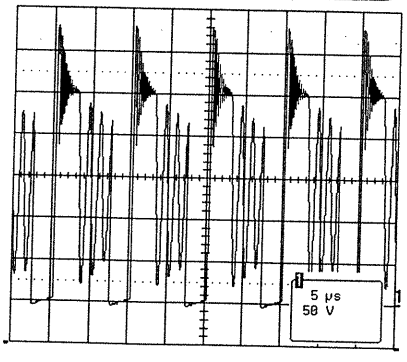
P3 T905 P-1 WINDING VOLTAGEÅ



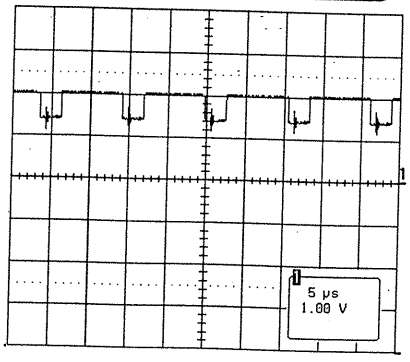
P4 T901 11-P WINDING VOLTAGE (SUB TRANS)



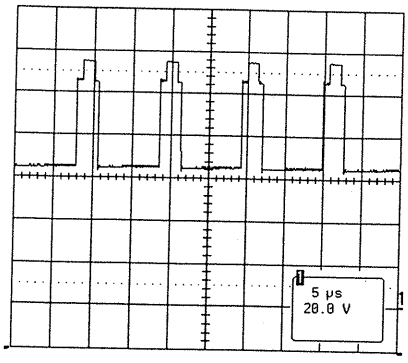
P5 T901 1-P WINDING VOLTAGE (SUB TRANS)



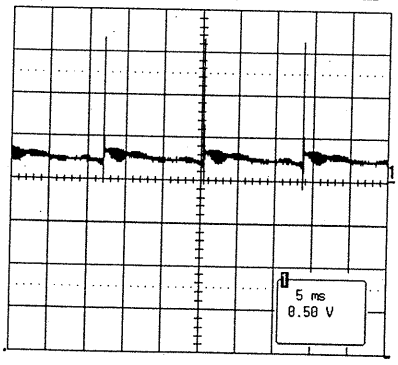
V1 P801 1-P (R-VIDEO INPUT VOLTAGE)



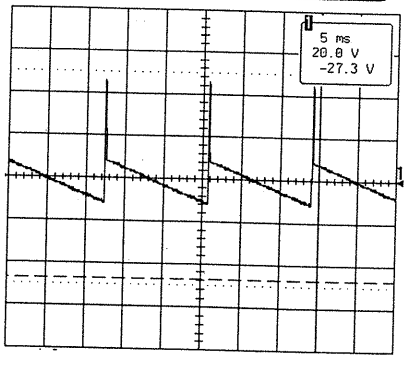
V2 R-VIDEO CATHODE VOLTAGE



V3 P909 1-P VOLTAGE (H-STA OUTPUT)



D1 VERTICAL DEFLECTION OUTPUT VOLTAGE



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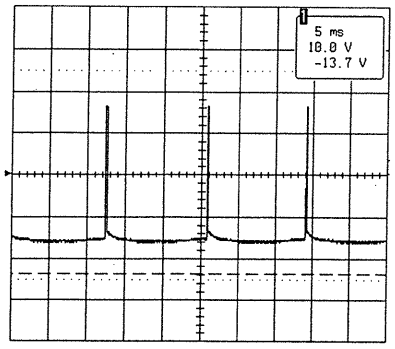
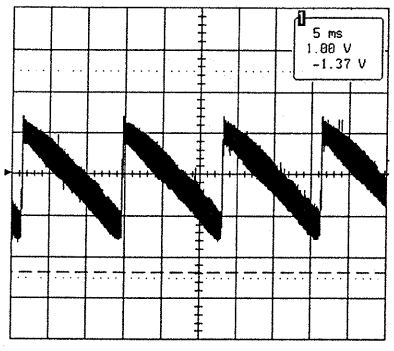
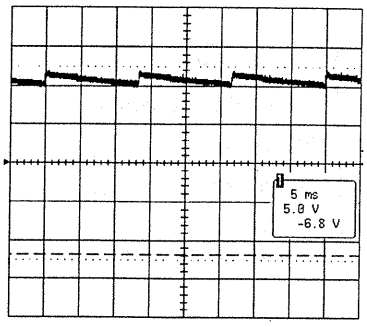
D2 VERTICAL DEFLECTION PUMP-UP VOLTAGE



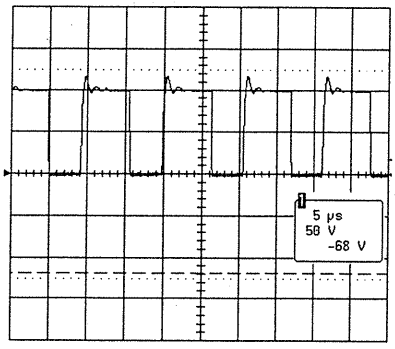
D3 VERTICAL DEFLECTION DY RETURN VOLTAGE



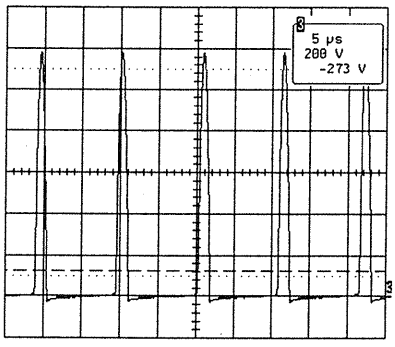
D4 VERTICAL DEFLECTION PROTECTION LINE VOLTAGE



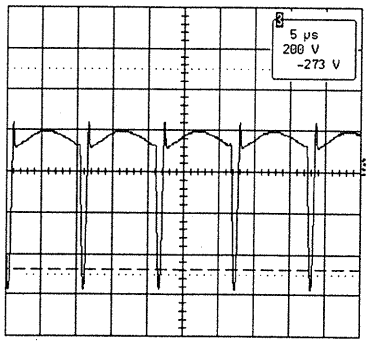
D5 HORIZONTAL DRIVE DRAIN PULSE (T301-1P)



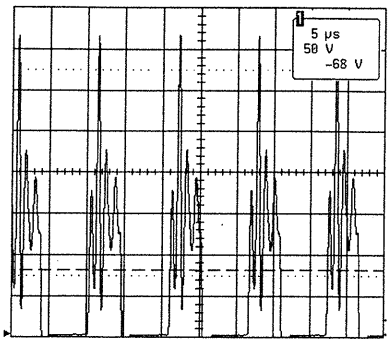
D6 HORIZONTAL OUTPUT COLLECTOR PULSE (Q307-C)



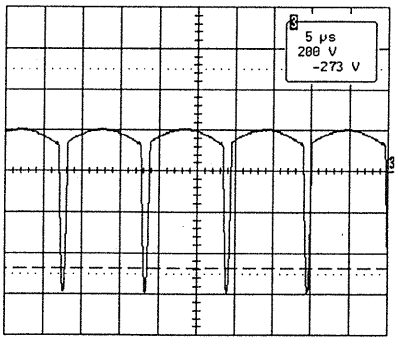
D7 HORIZONTAL DEFLECTION YOKE RETURN VOLTAGE



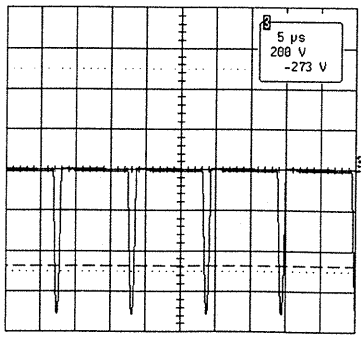
D8 HORIZONTAL DRIVE PULSE (T301-3P)



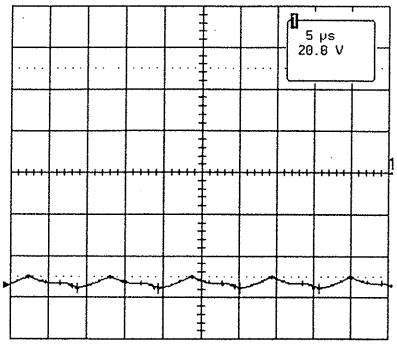
D9 HORIZONTAL NEGATIVE PULSE (DAC NEGATIVE PULSE)



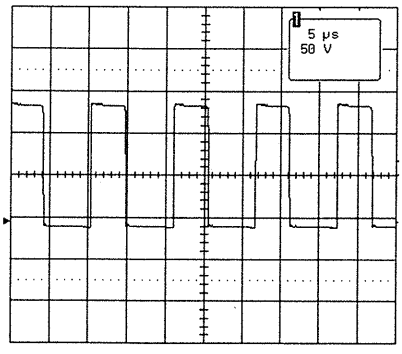
D10 HORIZONTAL NEGATIVE PULSE (SIZE CONTROL PULSE)



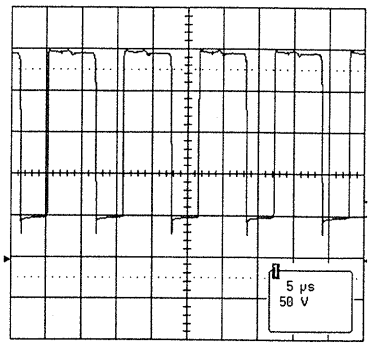
D11 HORIZONTAL SIZE CONTROL VOLTAGE



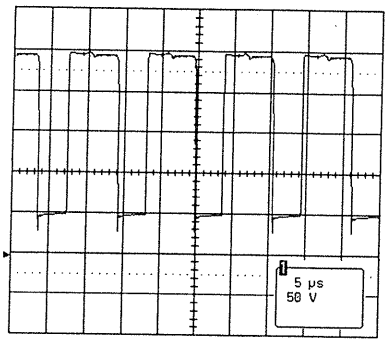
D12 HORIZONTAL SIZE CONTROL CHOPPER PULSE



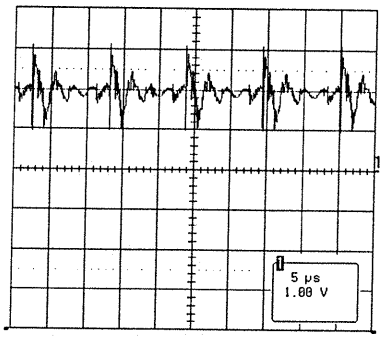
D13 HORIZONTAL DEFLECTION CONTROL CHOPPER PULSE



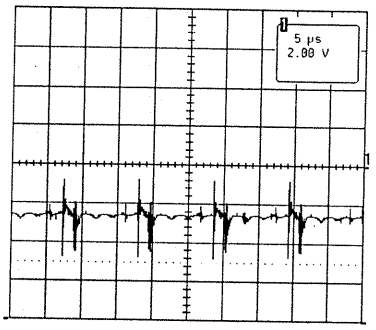
D14 HORIZONTAL POSITION RECTIFIED VOLTAGE



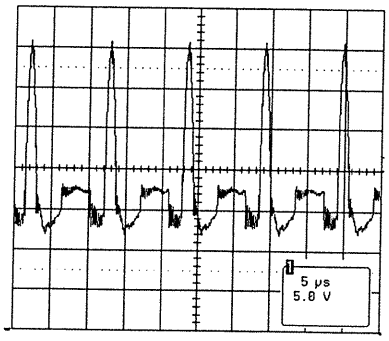
D15 HV SENSING LINE VOLTAGE-1 (HV PROTECTION)



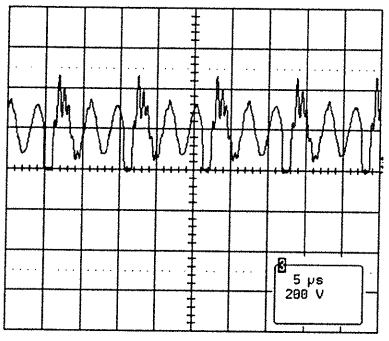
D16 HV SENSING VOLTAGE-2(HV CONTROL)



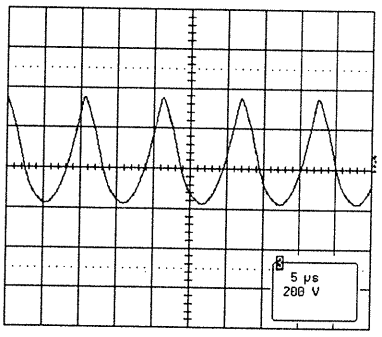
D17 HV TRIGGER WINDING PULSE (T402)



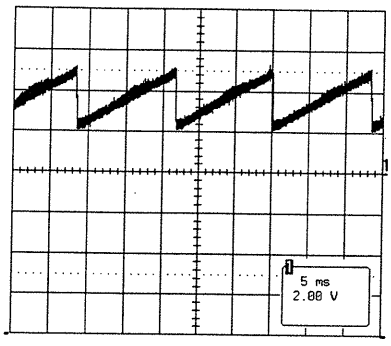
D18 HV CONTROL MOS DRAIN PULSE



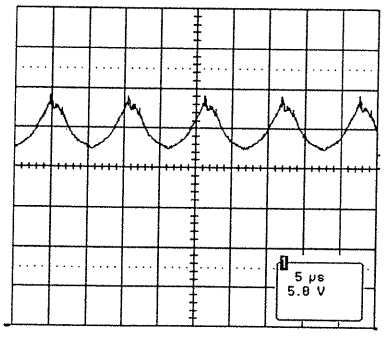
D19 DYNAMIC FOCUS OUTPUT VOLTAGE



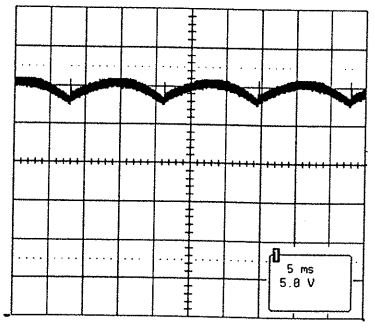
D20 VERTICAL SIZE CONTROL SIGNAL VOLTAGE



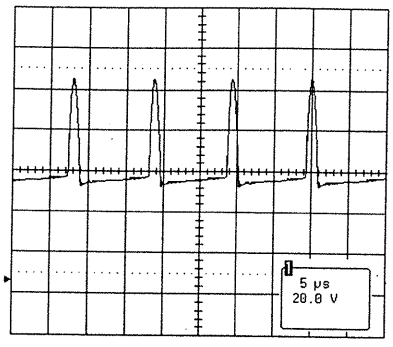
D21 HORIZONTAL DYNAMIC FOCUS CONTROL VOLTAGE



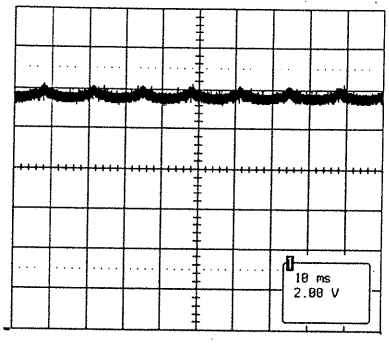
D22 VERTICAL DYNAMIC FOCUS CONTROL VOLTAGE



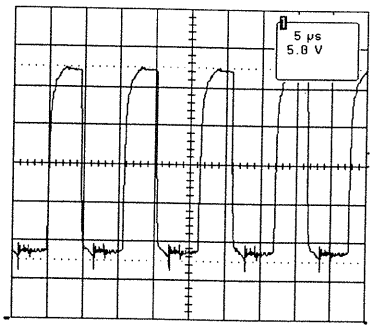
D23 AFC PULSE



D24 E-W DISTORTION CORRECTION PARABOLIC WAVE



D25 COLLECTOR PULSE CONTROL PULSE (IC305-2P)



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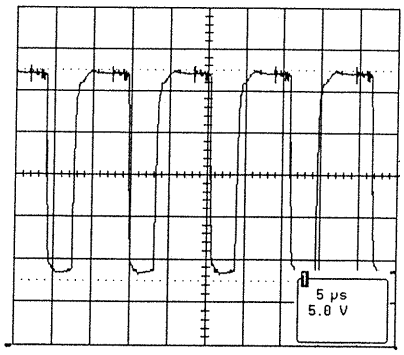
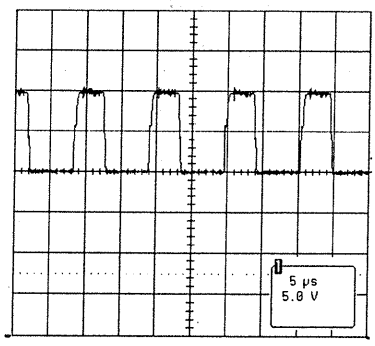
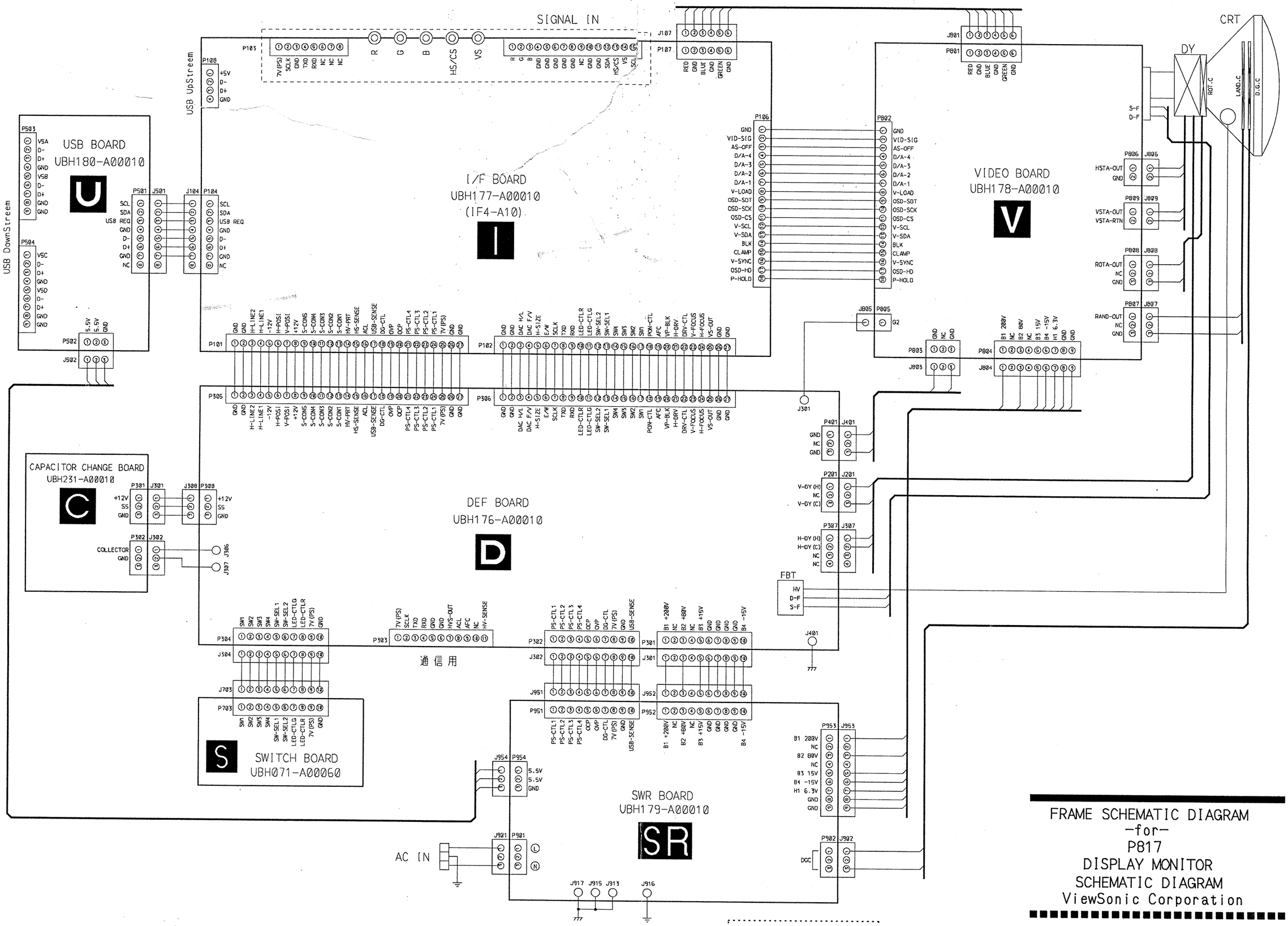
D26 HORIZONTAL SIZE CONTROL PULSE (IC305-5P)



D27 HORIZONTAL DRIVE PULSE (IC305-14P)





FRAME SCHEMATIC DIAGRAM
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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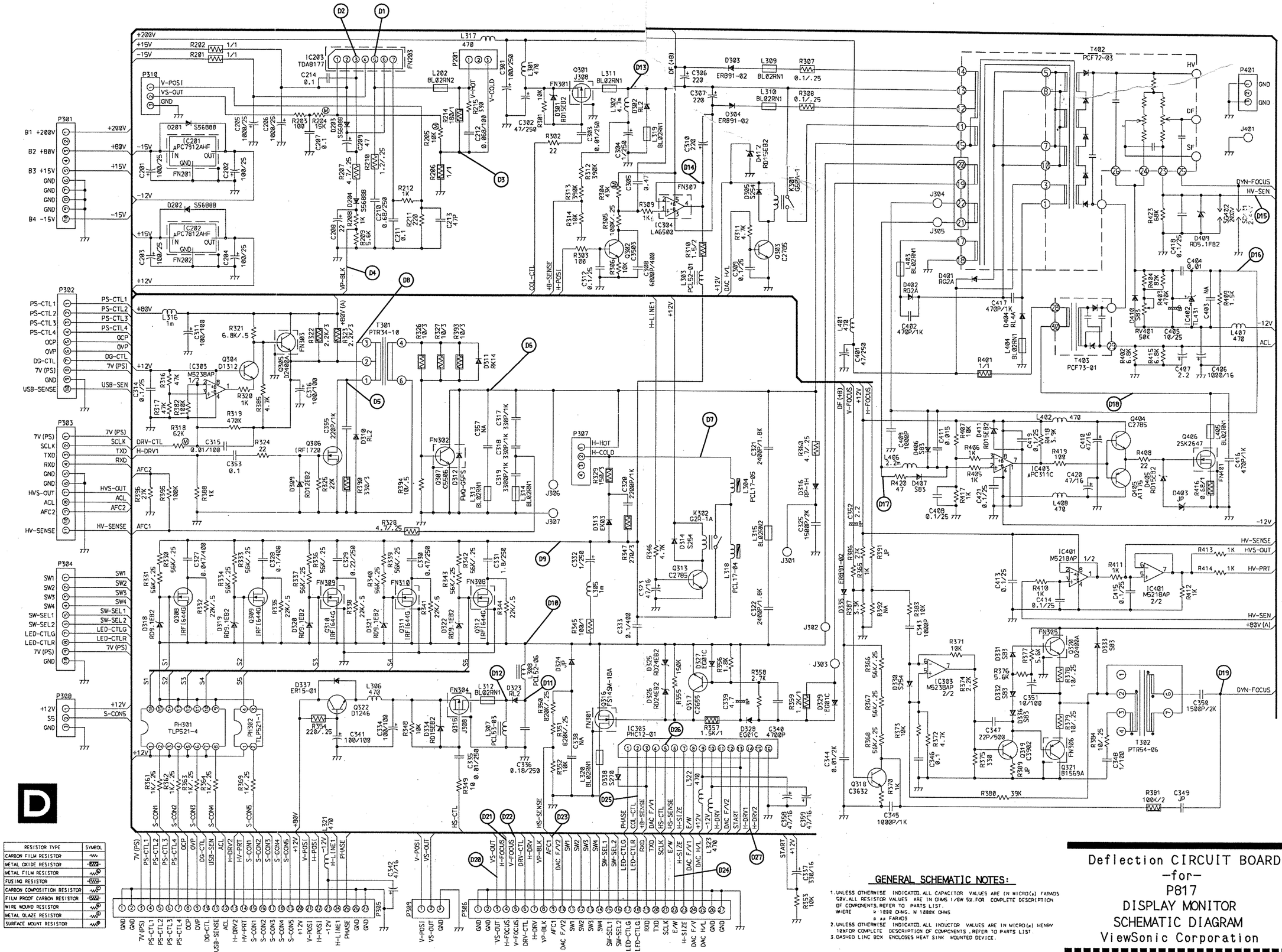

RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL OLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
   WHERE K = 1000 OHMS, M 1000K OHMS
   P = pF FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10%FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

Deflection CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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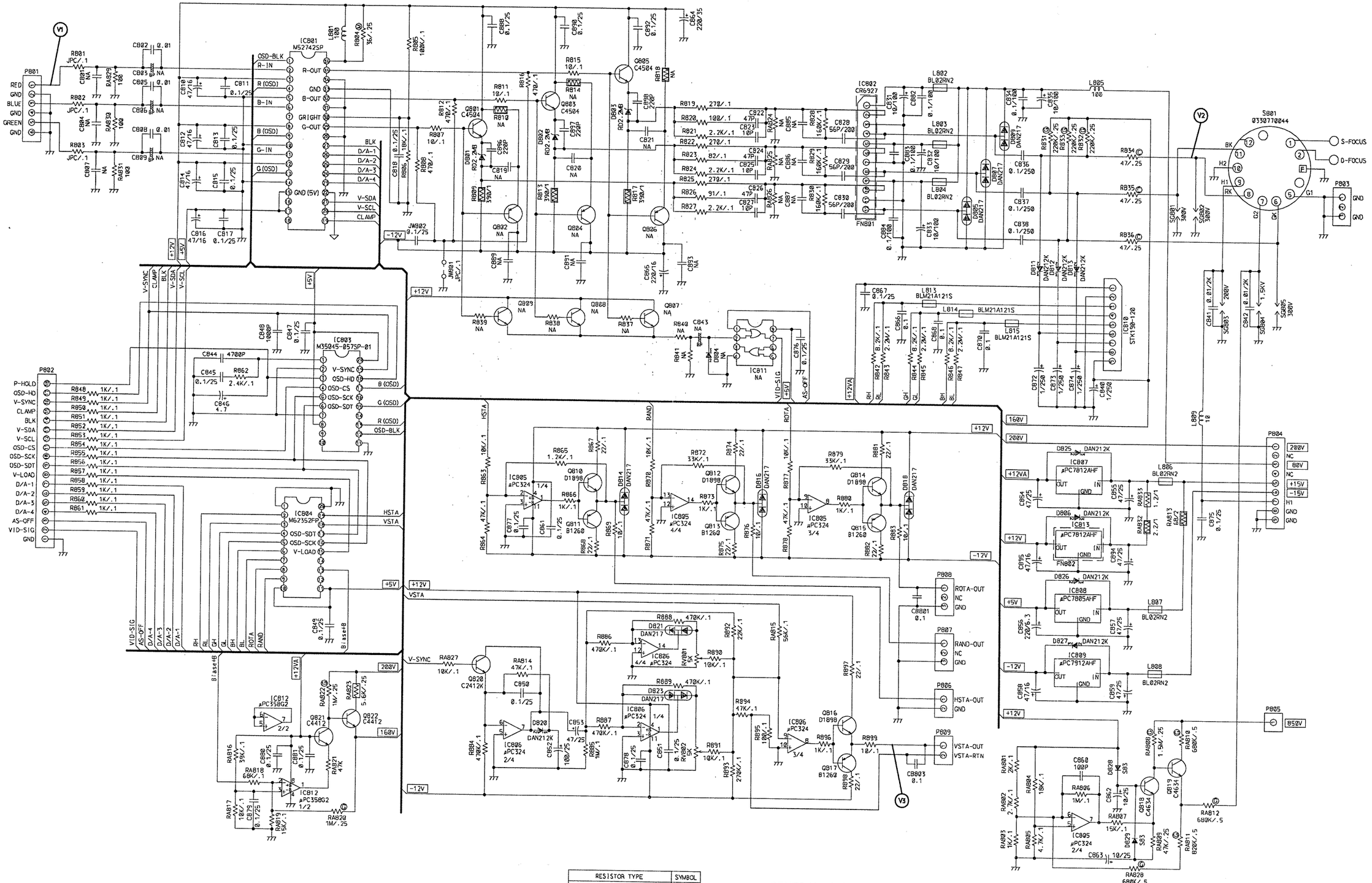

RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
   WHERE k-1000 OHMS. M-1000K OHMS
   p-μμ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10% FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

VIDEO CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
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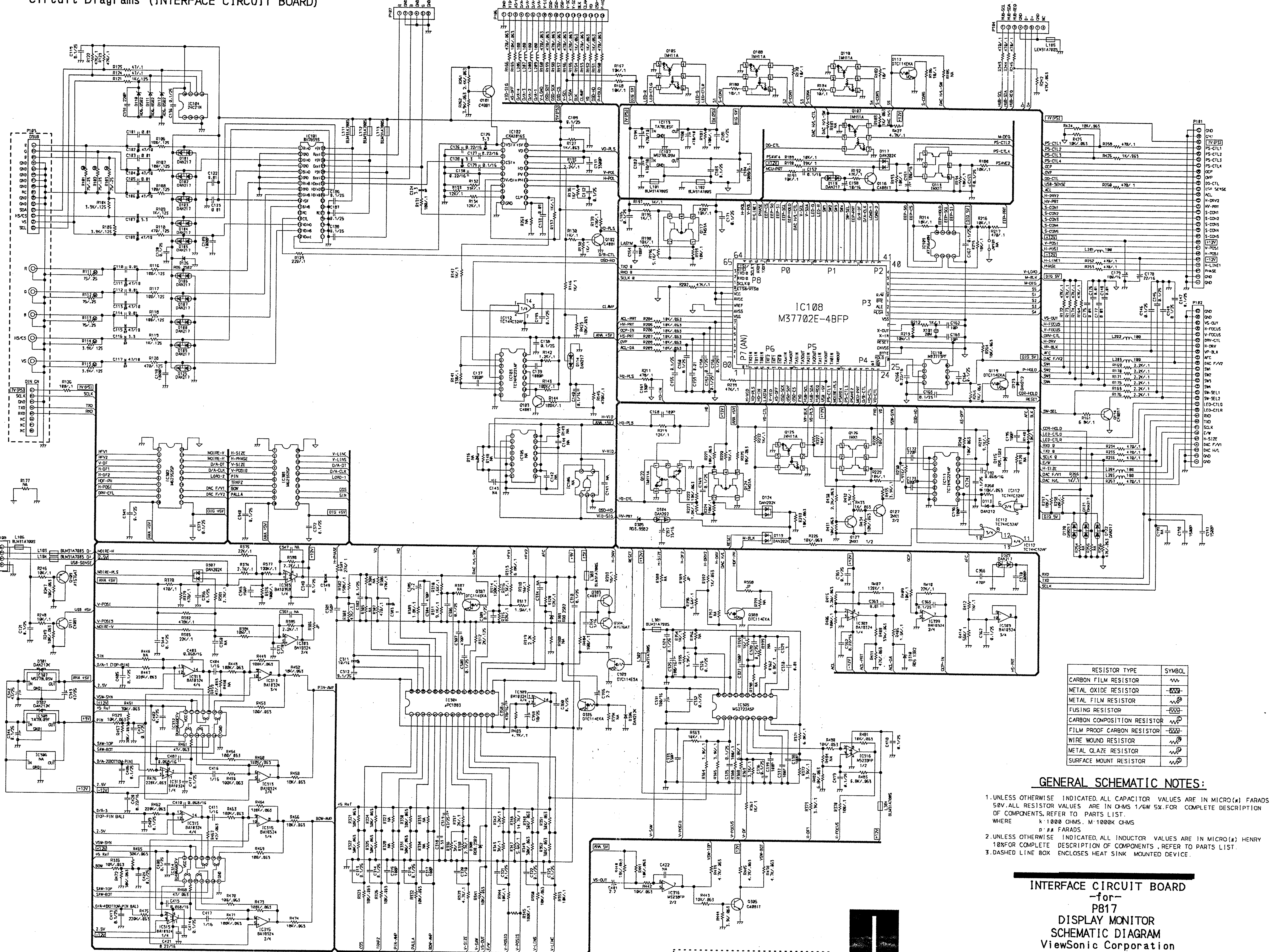
Circuit Diagrams (INTERFACE CIRCUIT BOARD)



RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
   WHERE k: 1000 OHMS. M: 1000K OHMS
   p: μμ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10% FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

INTERFACE CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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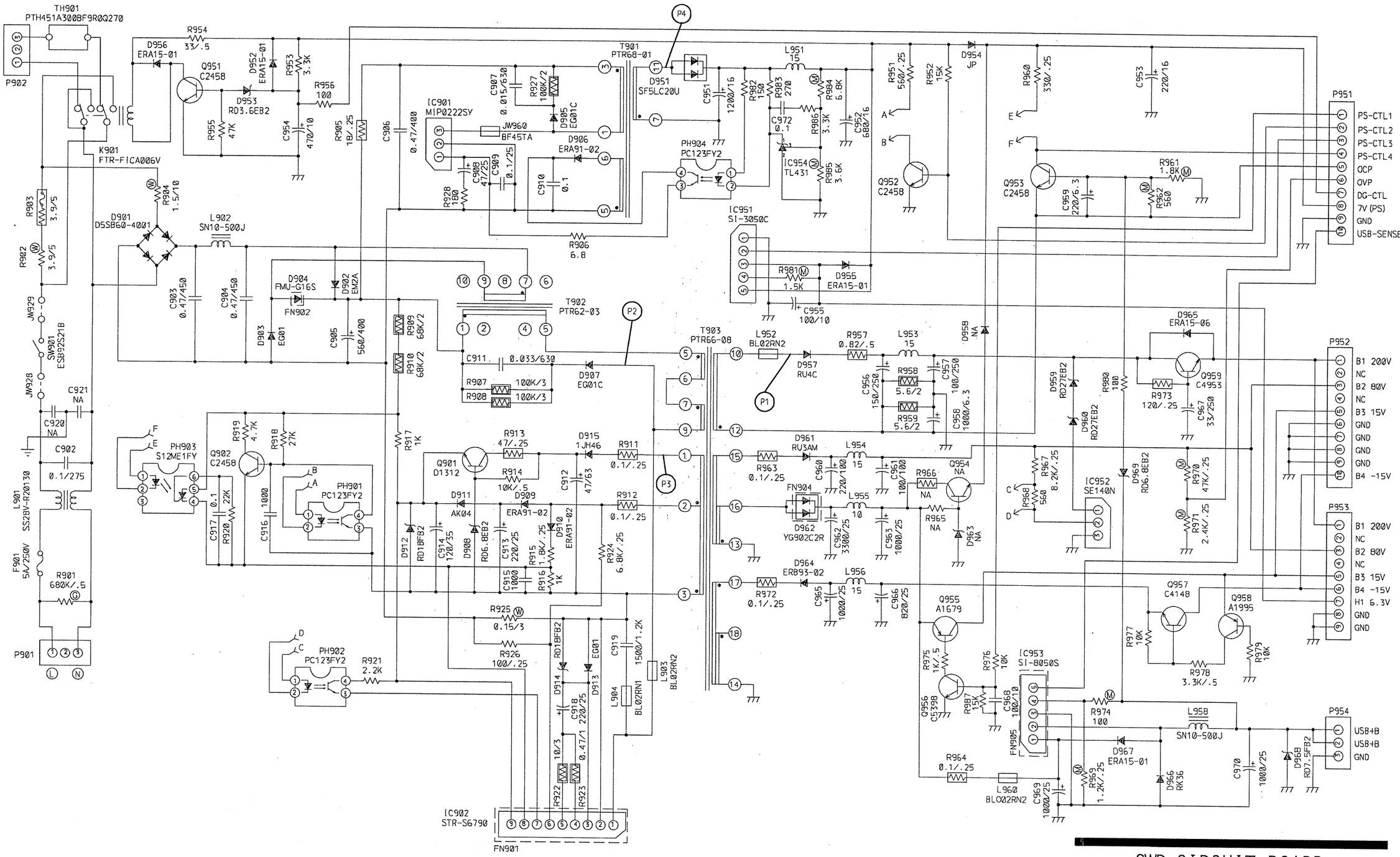
Circuit Diagrams (SWR CIRCUIT BOARD)



RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
   WHERE k=1000 OHMS, M=1000K OHMS
   p.xx FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10%FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

SR

SWR CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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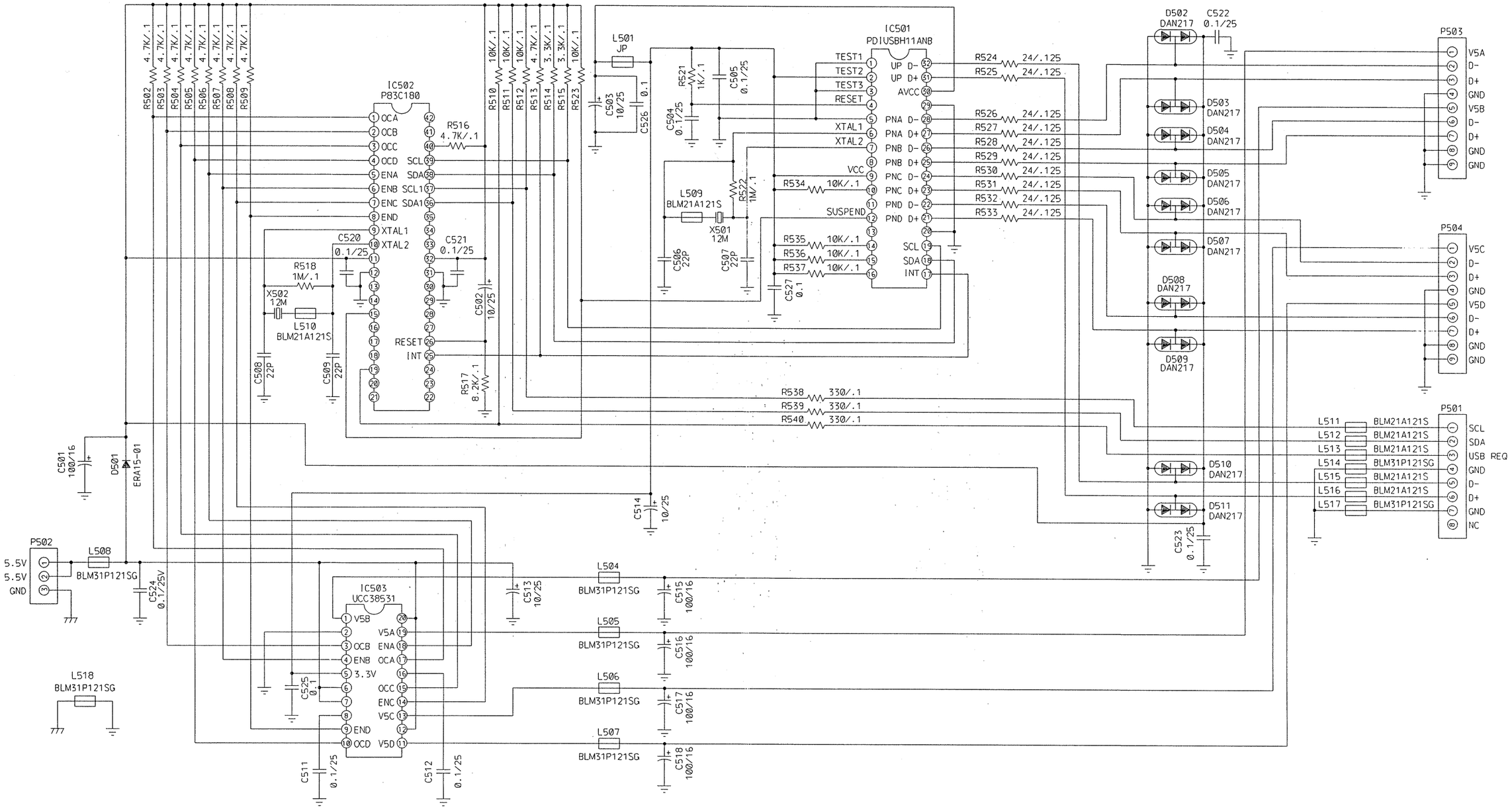

RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST
   WHERE k:1000 OHMS. M:1000K OHMS
   p:μμ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10%FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

USB CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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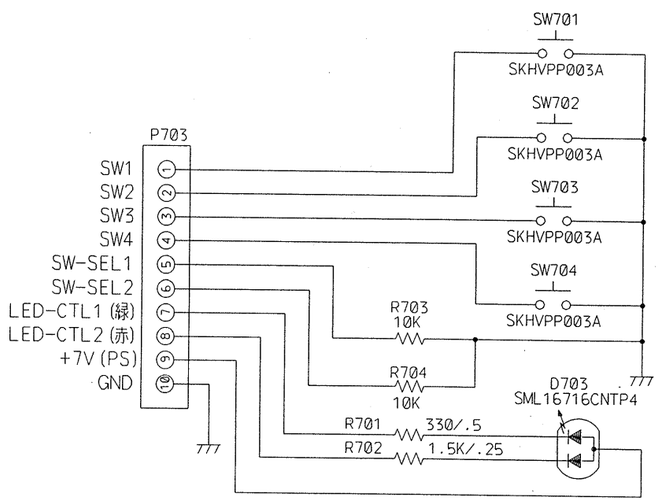

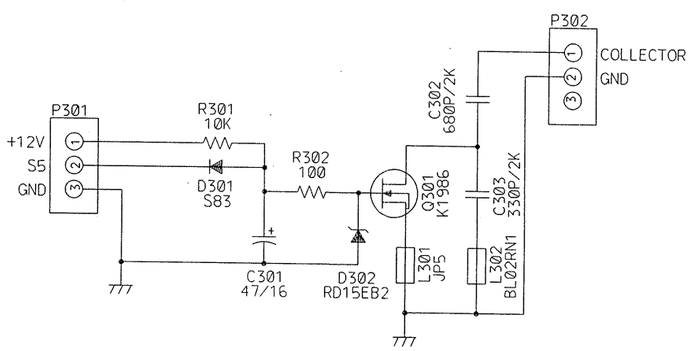

S

C

RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	
SURFACE MOUNT RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS 50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
   WHERE k:1000 OHMS. M:1000K OHMS
   p:μμ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY 10%FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

SWITCH&CAPASITOR CHANGE
CIRCUIT BOARD
-for-
P817
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

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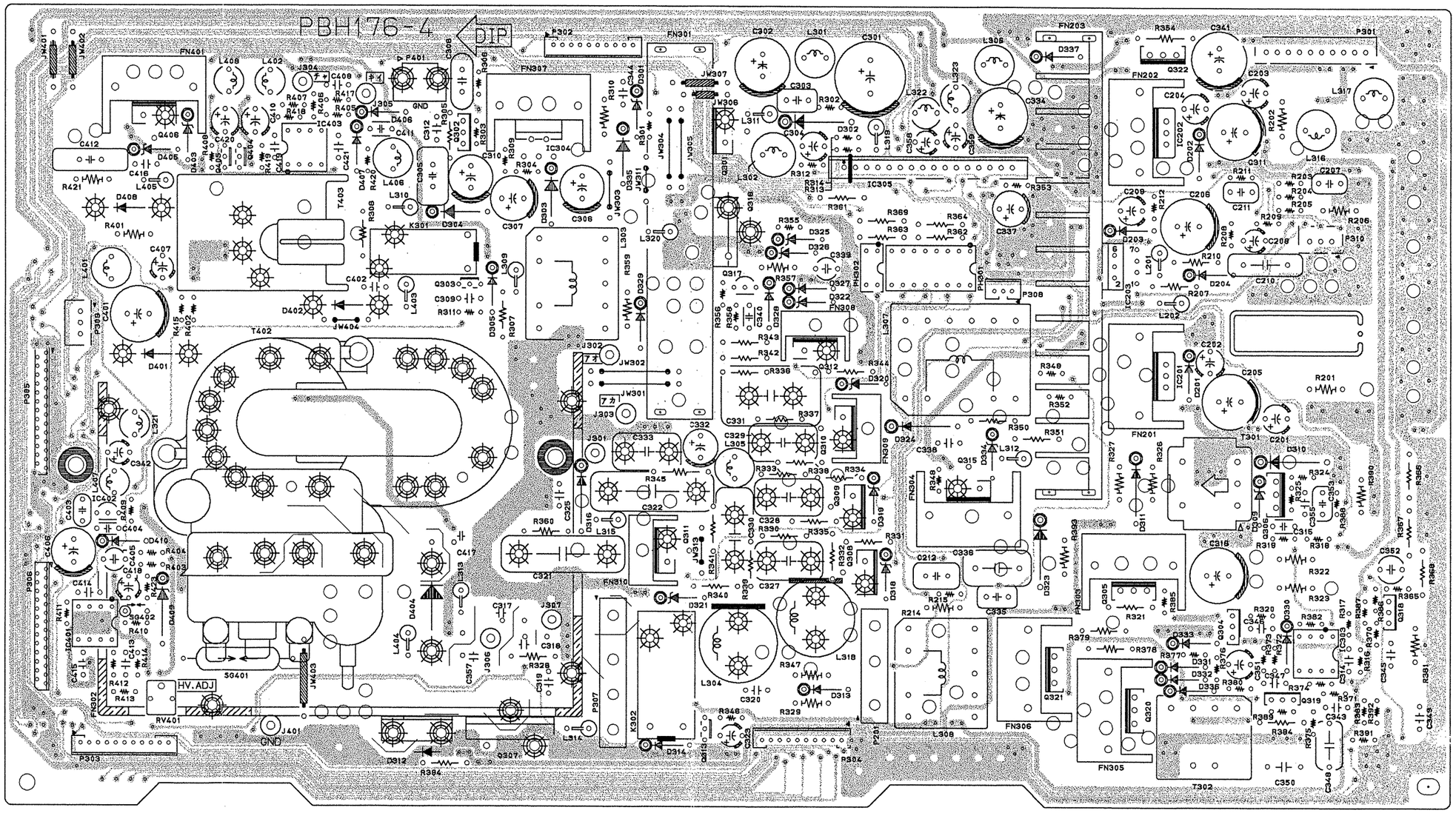
10.2 PRINTED WIRING BOARD



Parts Side

D

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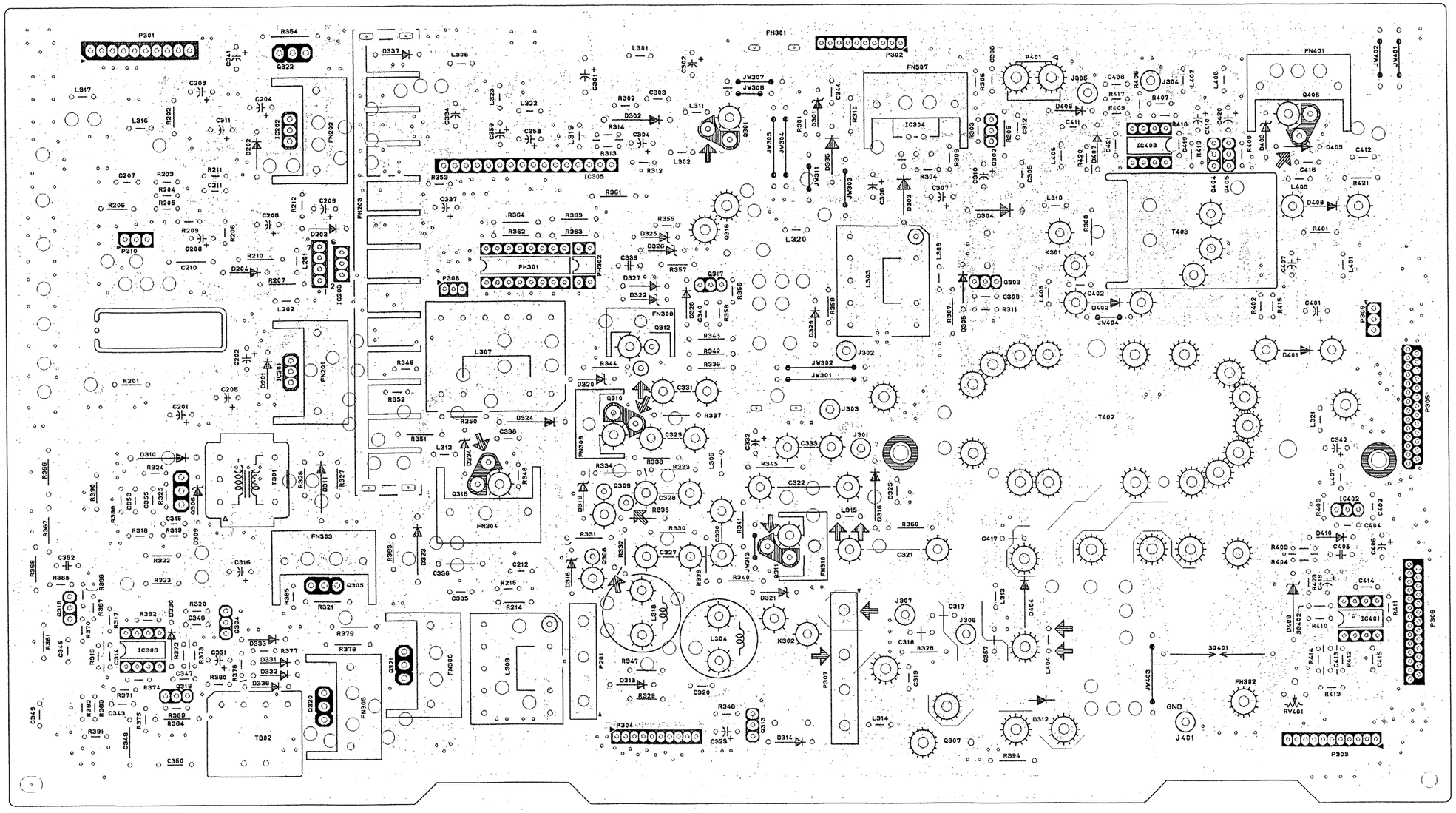
Deflection BOARD
- for -
P817
COLOR CRT
DISPLAY MONITOR
Printed wiring Board
ViewSonic Corpration



Solder Side

D

Deflection BOARD

- for -

P817

COLOR CRT

DISPLAY MONITOR

Printed wiring Board

ViewSonic Corpration

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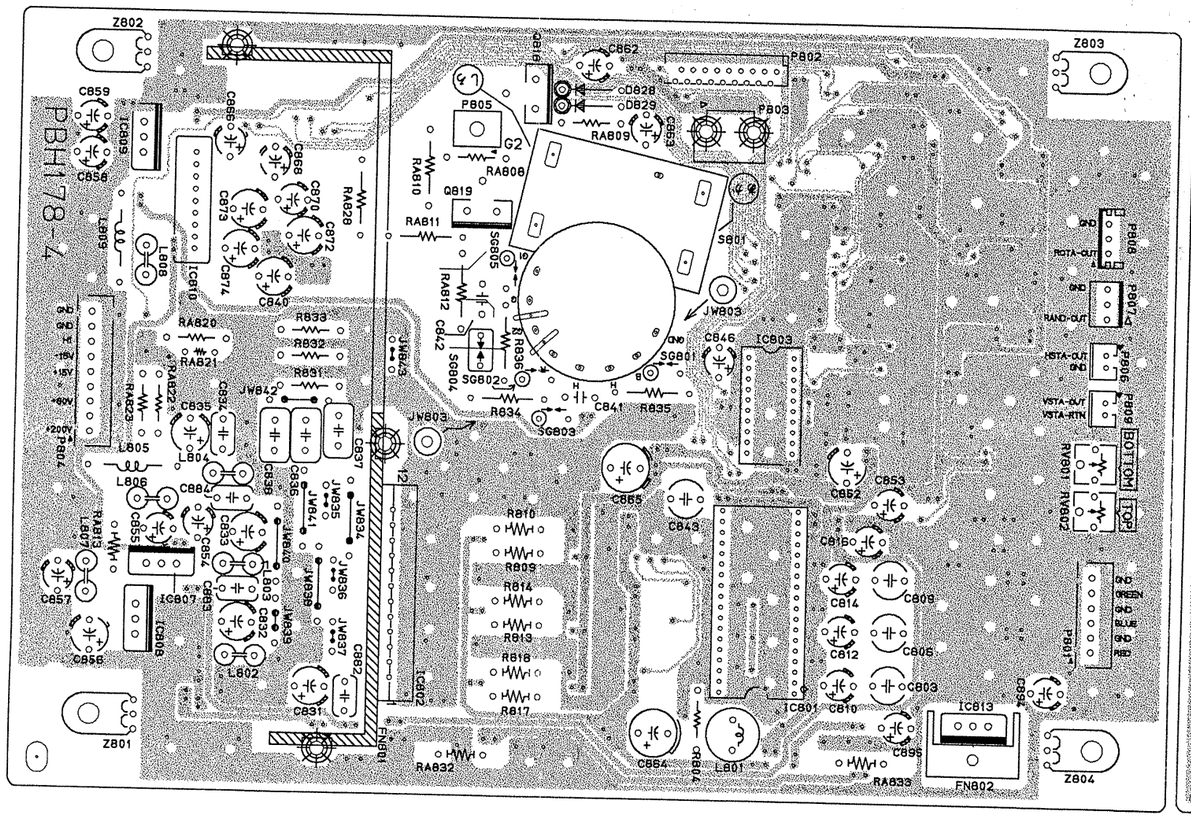
PBH178-4
Z802
Z803
Z801
Z804
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P806
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P812
P813
P814
P815
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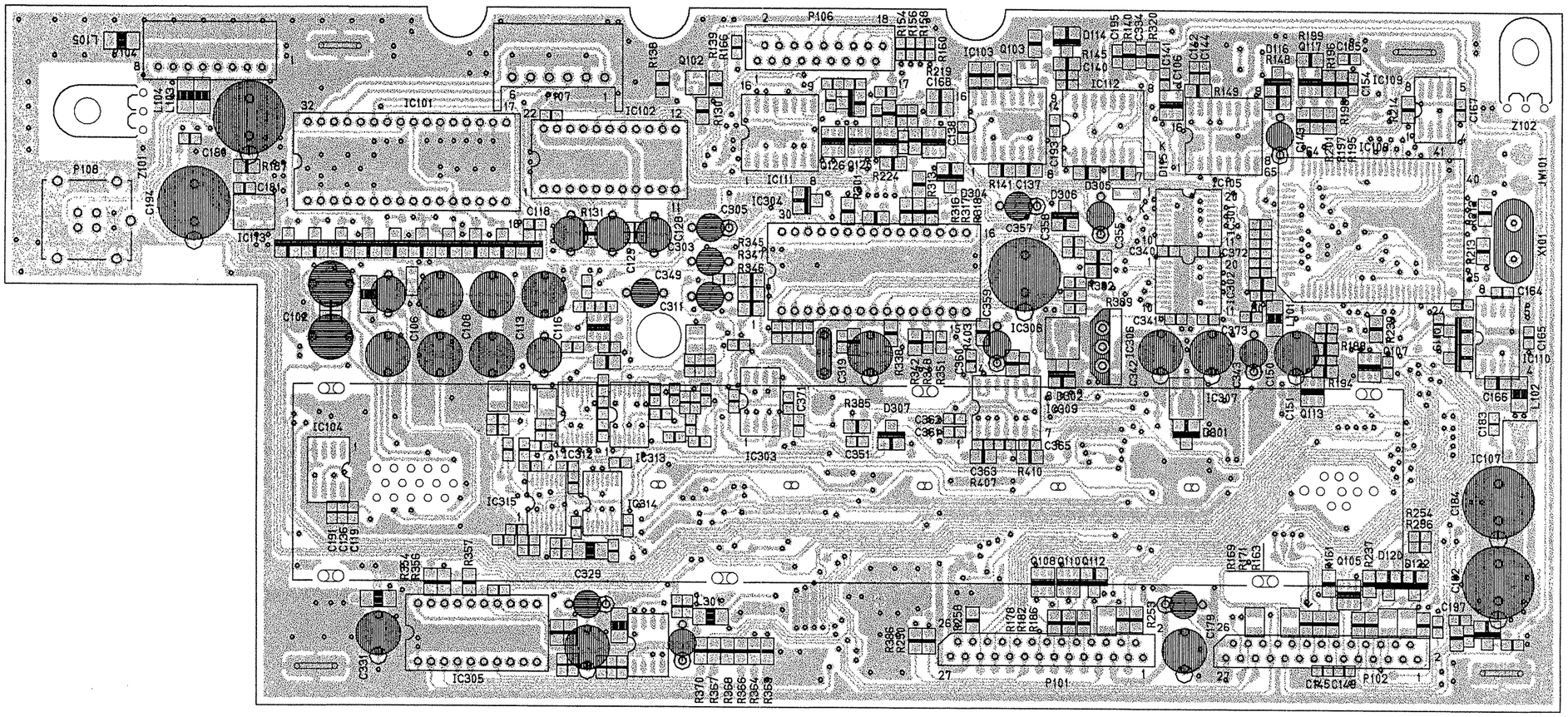
P844


P106
IC101
IC102
IC103
Q103
IC112
IC111
IC304
IC306
IC307
IC303
IC313
IC315
IC305
P108
P107
P101
Z101
Z102
IC104
IC109
IC110
IC107
Q102
Q107
Q113
Q105
D120
D122
D801
D802
D803
D305
D306
D307
C105
C164
C165
C166
C167
C183
C184
C185
C197
R102
R192
R198
R199
R254
R256
R257
R258
R259
R260
R261
R262
R263
R264
R265
R266
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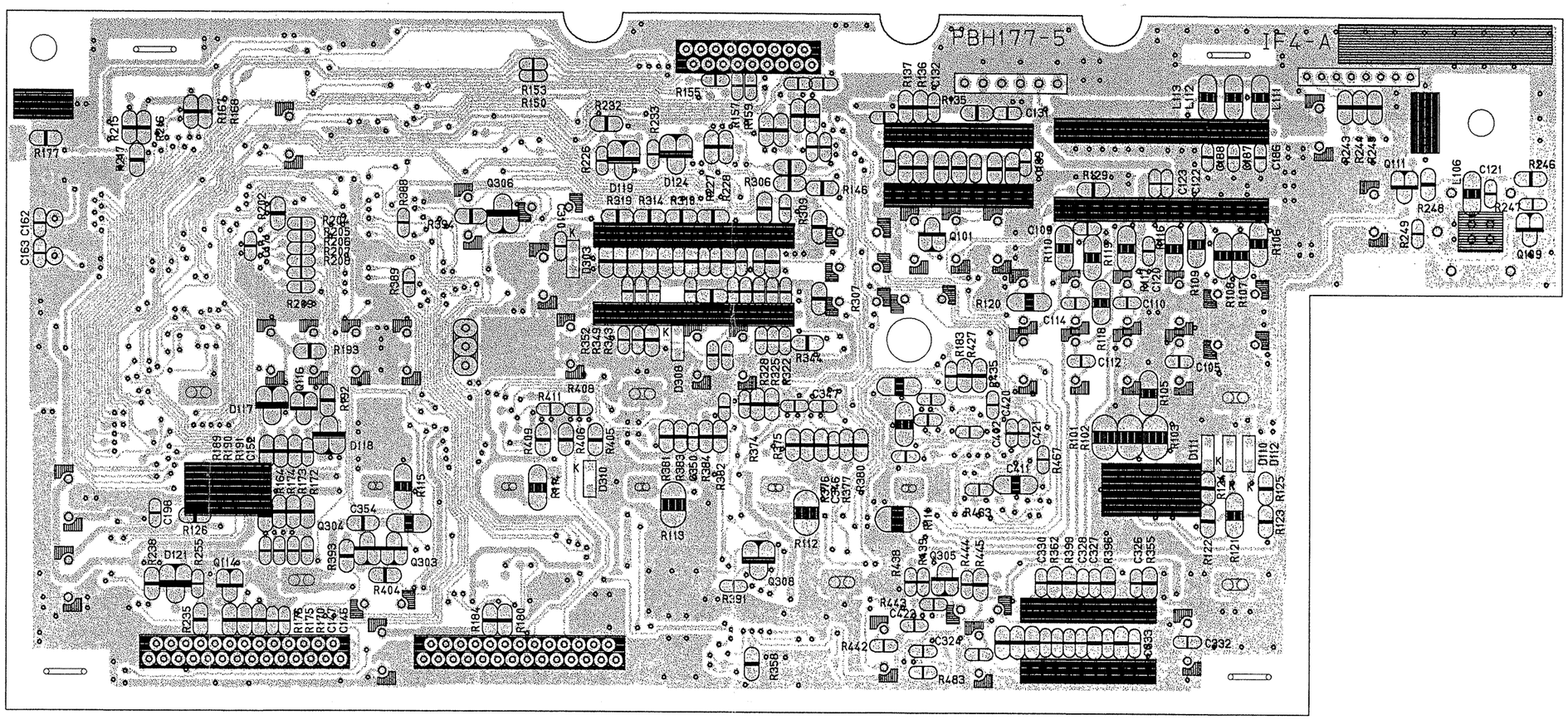
R295



Solder Side

Interface BOARD

- for -

P817

COLOR CRT

DISPLAY MONITOR

Printed wiring Board

ViewSonic Corpration

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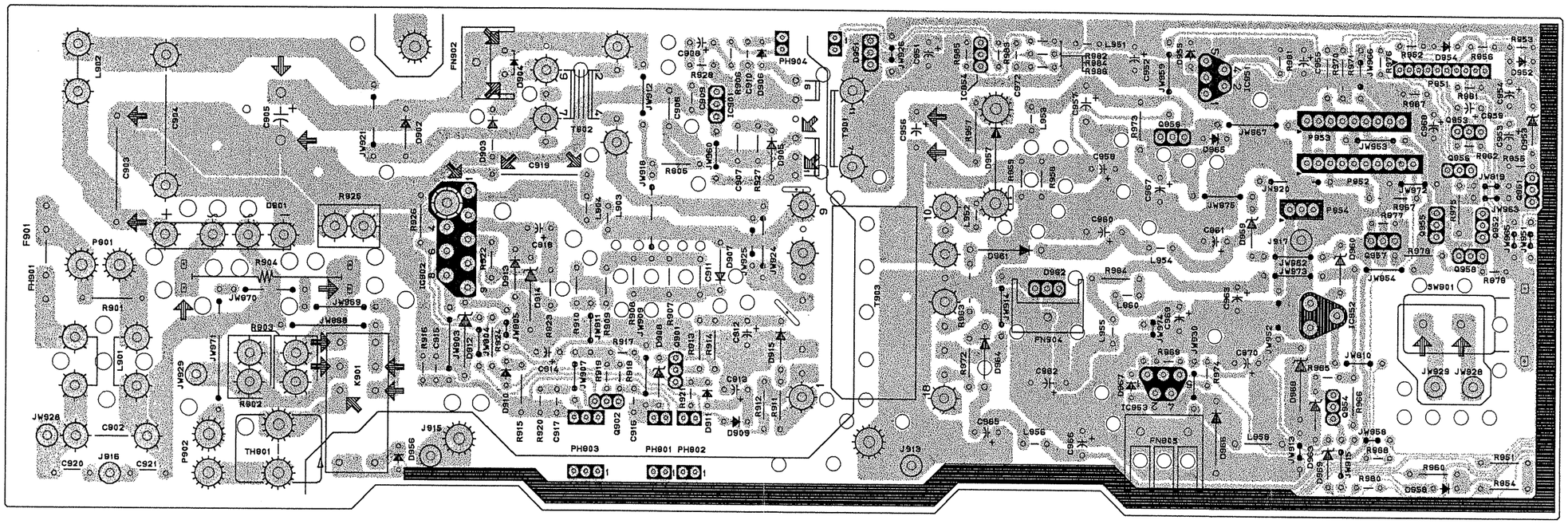

Solder Side

SR

Switching Power Supply BOARD

- for -

P817

COLOR CRT

DISPLAY MONITOR

Printed wiring Board

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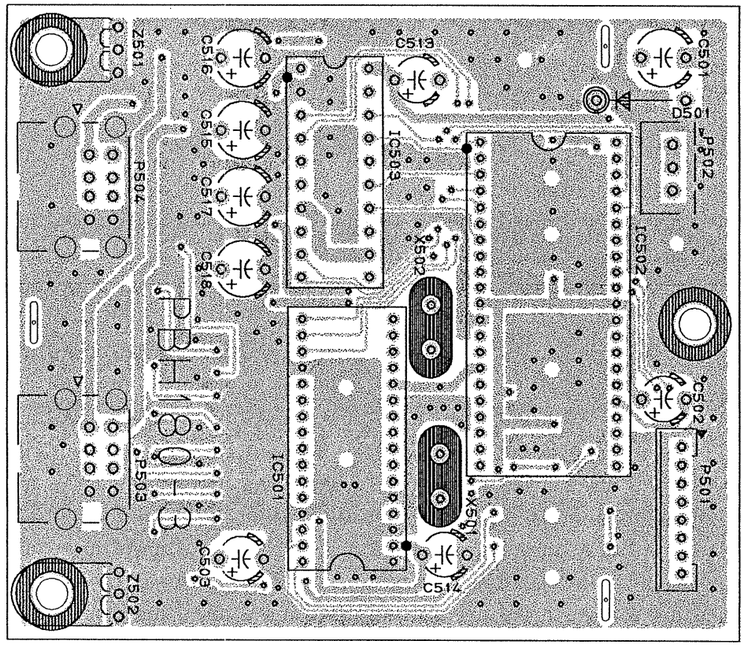
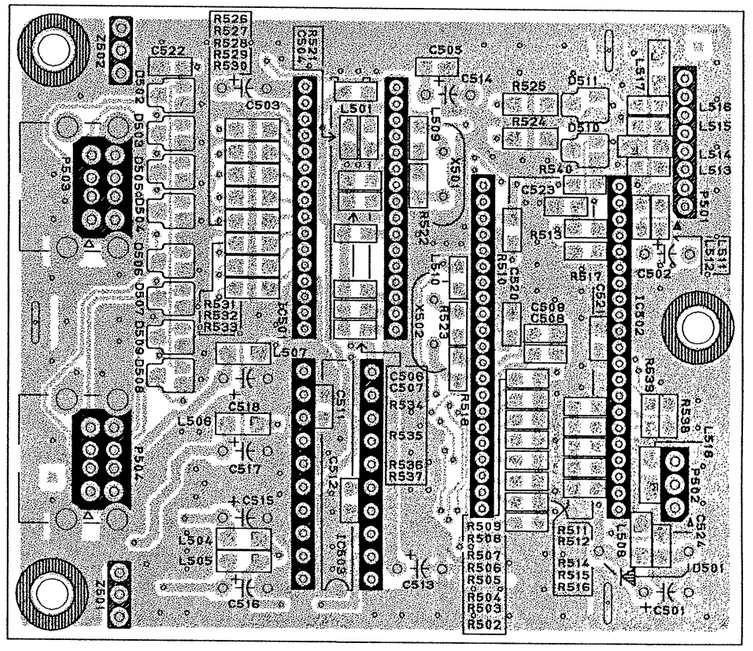
U

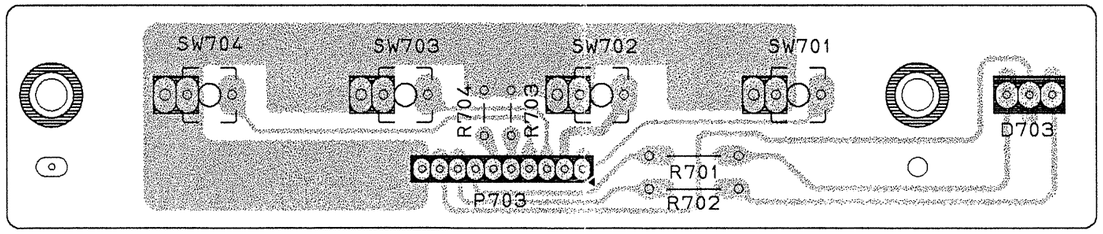


Parts Side

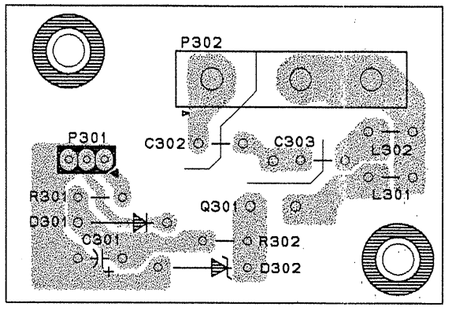


Solder Side

S



C



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USB BOARD
Switch Board
Capacitor Change Board
- for -
P817
COLOR CRT
DISPLAY MONITOR
Printed wiring Board
ViewSonic Corpration

SECTION 11 EXPLODED VIEW and PARTS LIST

Model#: P817

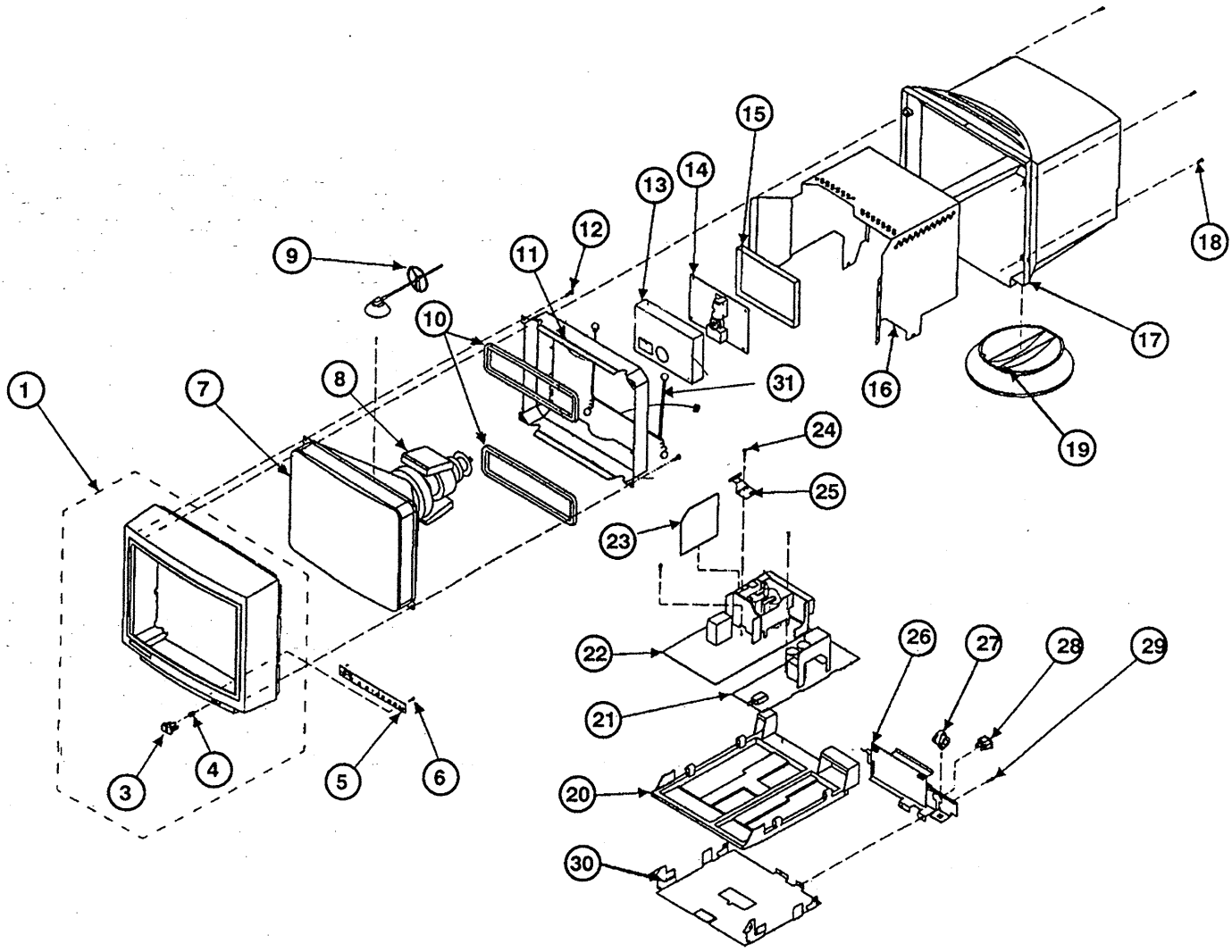
The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
1	bezel assembly		9U62078-00	
3	include bezel assembly			
4	include bezel assembly			
5	**SW board assembly**			
6	tapping screw (BV)	3.0dia x 8	9Z03607-00	
7	**CRT**	**M51LLB673X11**	**9T38020-00**	⚠ #
8	**Deflection Yoke (integrated in CRT)**			
9	HV cable holder	3-704-372-01	9W70404-00	
10	Degauss coil	PCL63-11	8F81440-00	
11	CRT shield assembly		9U70423-01	
12	frange tapping screw		9W36503-00	
13	shield VA			
14	**Video board assembly**			#
15	shield VB			
16	shield cover			
17	coverASSY		9U61033-00	
18	tapping screw (BV)		9Z03682-00	
19	tilt assembly		9U69080-03	
20	bracket D		9U69075-01	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
21	**SW regulator board assembly**			#
22	**Deflection board assembly**			#
23				⚠ #
24	tapping screw (BV)	3.0dia x 8	9Z03607-00	
25	bracket MCU		9U70392-02	
26	**I/F assembly**			#
27	holder core			
28	AC inlet	AC-P03C505	9T89119-00	
29	tapping screw +ext.tooth washer	4.0dia x8	9Z03677-01	
30	shield D		9U70427-00	
31	CRT GND ASSY			
32	**PWM Board assemble**			#

NOTE

The construction parts of an assembled parts are indicated with a collation number in the remark column.



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SECTION 12 Electrical Parts List

Model#: **P817**

The components identified by Δ are critical for safety. Replace only with code number specified

NOTE
All variable and adjustable resistors have characteristic curv B, unless otherwise noted.

RESISTORS
All resisters are in ohms

The components identified by Δ in this manual have been carefully factory selected for each set in order to satisfy regulations regarding X-ray radiation. Should replacement be required, replace only with the value originally used.

There are some cases the reference number on one board overlaps on the other board. therefore, when ordering parts by the reference number, please include the board name.

Δ

DEFLECTION BOARD

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
		<PWB>		
PB001	PWB	PBH176-4	9T13176-04	
IC201	IC	µPC7912AHF	9T30052-00	Δ
IC202	IC	µPC7812AHF	9T30036-00	Δ
IC203	IC	TDA8177	9T26712-00	Δ
		<INTERGRATEDCIRCUIT>		
IC303	IC	M5238AP	9T34511-00	
IC304	IC	LA6500	9T34431-00	
IC305	HIC	PHC12-01	9T37121-00	
IC401	IC	M5218AP	9T34503-00	
IC402	IC	TL431CLPB	9T33404-00	Δ
IC403	IC	µPC311C	9T30062-00	
		<TRANSISTOR&FET>		
Q301	MOSFET	2SJ308-TOK-CBC7	9T45012-00	
Q302	Transistor	2SC3503-E/F-CD	9T42531-01	
Q303	Transistor	2SC2785-JL/HL-T	9T42449-50	
Q304	Transistor	2SD1312-L/K-T	9T44250-50	
Q305	Transistor	2SD2400A	9T44272-00	
Q306	FET	IRFI720G	9T45064-00	
Q307	Transistor	2SC5506-RA	9T42760-00	
Q308	MOSFET	IRFI644G-LF33	9T45063-00	
Q309	MOSFET	IRFI644G-LF33	9T45063-00	
Q310	MOSFET	IRFI644G-LF33	9T45063-00	
Q311	MOSFET	IRFI644G-LF33	9T45063-00	
Q312	MOSFET	IRFI644G-LF33	9T45063-00	
Q313	Transistor	2SC2785-JL/HL-T	9T42449-50	
Q315	MOSFET	2SJ308-TOK-CBC7	9T45012-00	
Q316	MOSFET	FS14SM-18A-A8	9T45110-00	
Q317	Transistor	2SC2655-Y-TPE6	9T42432-50	
Q318	Transistor	2SC3632	9T42500-00	
Q319	Transistor	2SC3902-R/S/T	9T42516-00	
Q320	Transistor	2SD2400A	9T44272-00	
Q321	Transistor	2SB1569A	9T41111-00	
Q322	Transistor	2SD1264A-P(SB)	9T44231-01	
Q404	Transistor	2SC2785-JL/HL-T	9T42449-50	
Q405	Transistor	2SA1175-JL/HL-T	9T40251-50	
Q406	FET	2SK2647-01MR	9T45095-01	Δ
		<DIODE>		
D201	Diode	S5688B-TPA3	9T47050-50	
D202	Diode	S5688B-TPA3	9T47050-50	
D203	Diode	S5688B-TPA3	9T47050-50	
D204	Diode	S5688B-TPA3	9T47050-50	
D301	DiodeZener	RD15EB2-TA11R	9T46080-50	
D302	Diode	RL2LF-C4	9T47056-00	
D303	Diode	ERB91-02-L6	9T47292-01	
D304	Diode	ERB91-02-L6	9T47292-01	
D305	Diode	1SS254T-77	9T47203-50	
D309	DiodeZener	RD12EB2-TA11R	9T46072-50	
D310	Diode	RL2LF-C4	9T47056-00	
D311	Diode	RK14LF-A1	9T47250-00	
D312	Diode	FMQ-G5FS	9T47144-00	
D313	Diode	EK03LF-F4	9T47248-00	
D314	Diode	1SS254T-77	9T47203-50	
D316	Diode	RP-1H	9T47105-00	
D318	DiodeZener	RD9.1EB2-TA11R	9T46059-50	
D319	DiodeZener	RD9.1EB2-TA11R	9T46059-50	
D320	DiodeZener	RD9.1EB2-TA11R	9T46059-50	
D321	DiodeZener	RD9.1EB2-TA11R	9T46059-50	
D322	DiodeZener	RD9.1EB2-TA11R	9T46059-50	
D323	Diode	RL2LF-C4	9T47056-00	
D324	Jumper	J1/4ZT52A	9T91910-50	
D325	DiodeZener	RD24EB2-TA11R	9T46102-50	
D326	DiodeZener	RD24EB2-TA11R	9T46102-50	
D327	Diode	EG01C-V0	9T47164-50	
D328	Diode	EG01C-V0	9T47164-50	
D329	Diode	EG01C-V0	9T47164-50	
D330	Diode	1SS254T-77	9T47203-50	
D331	Diode	1SS83-TD	9T47202-50	
D332	Diode	1SS83-TD	9T47202-50	
D333	Diode	1SS83-TD	9T47202-50	
D334	DiodeZener	RD15EB2-TA11R	9T46080-50	
D335	Diode	ERB91-02-L6	9T47292-01	
D336	Diode	1SS83-TD	9T47202-50	
D337	Diode	ERA15-01V3	9T47086-50	
D401	Diode	RG2ALF-A1	9T47232-01	
D402	Diode	RG2ALF-A1	9T47232-01	
D403	Jumper	J1/4ZT26	9T91911-50	
D404	Diode	RL4ALF-L1	9T47057-00	
D405	DiodeZener	RD15EB2-TA11R	9T46080-50	
D406	Diode	1SS83-TD	9T47202-50	
D407	Diode	1SS83-TD	9T47202-50	
D408	N/A			
D409	DiodeZener	RD5.1FB222M	9T46335-01	
D410	Diode	1SS83-TD	9T47202-50	
D411	DiodeZener	RD15EB2-TA11R	9T46080-50	
D412	DiodeZener	RD15EB2-TA11R	9T46080-50	
		<PHHOTOCOUPLER>		
PH301	PhotoCoupler	TLP521-4-GB	9T49108-00	
PH302	PhotoCoupler	TLP521-1-GB	9T49105-00	
		<VARIABLERESISTOR>		
RV401	VariableResisitor	50K 0.3WB	9T50239-59	Δ
		<RESISTOR>		
R201	Fusible	1.0 1W	9T52961-51	
R202	Fusible	1.0 1W	9T52961-51	
R203	Carbon	100 1/6W	9T51013-51	

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The components identified by Δ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
R204	Metal	15K	1/6W	9T52005-55	
R205	Metal	10K	1/6W	9T52005-51	
R206	MetalOxide	1.0	1W	9T51661-51	
R207	Fusible	4.7	1/4W	9T52951-67	
R208	Carbon	1.0K	1/6W	9T51014-51	
R209	Carbon	5.6K	1/6W	9T51014-69	
R210	Fusible	1.5	1/4W	9T52951-55	
R211	Carbon	220	1/6W	9T51013-59	
R212	Carbon	1.0K	1/6W	9T51014-51	
R214	MetalOxide	180	1W	9T51663-57	
R215	Carbon	330	1/6W	9T51013-63	
R301	Carbon	10K	1/6W	9T51015-51	
R302	Carbon	22	1/6W	9T51012-59	
R303	Carbon	100	1/6W	9T51013-51	
R304	Metal	43K	1/6W	9T52005-66	
R305	Carbon	100K	1/4W	9T51026-51	
R306	Carbon	10K	1/6W	9T51015-51	
R307	Fusible	0.1	1/4W	9T59710-50	
R308	Fusible	0.1	1/4W	9T59710-50	
R309	Carbon	1.0K	1/6W	9T51014-51	
R310	MetalOxide	1.5	2W	9T51671-55	
R311	Carbon	4.7K	1/6W	9T51014-67	
R312	Carbon	390K	1/6W	9T51016-65	
R313	Carbon	390K	1/6W	9T51016-65	
R314	Carbon	10K	1/6W	9T51015-51	
R316	Carbon	47K	1/6W	9T51015-67	
R317	Carbon	47K	1/6W	9T51015-67	
R318	Metal	62K	1/6W	9T52005-70	
R319	Carbon	470K	1/6W	9T51016-67	
R320	Carbon	1.0K	1/6W	9T51014-51	
R321	Carbon	6.8K	1/2W	9T51054-71	
R322	MetalOxide	2.2K	3W	9T51684-59	
R323	MetalOxide	2.2K	3W	9T51684-59	
R324	Carbon	22	1/6W	9T51012-59	
R325	Carbon	22K	1/6W	9T51015-59	
R326	MetalOxide	10	3W	9T51682-51	
R327	MetalOxide	10	3W	9T51682-51	
R328	Fusible	4.7	1/4W	9T52951-67	
R329	MetalOxide	150	3W	9T51703-55	
R330	Carbon	56K	1/4W	9T51025-69	
R331	Carbon	56K	1/4W	9T51025-69	
R332	Carbon	22K	1/2W	9T51055-59	
R333	Carbon	56K	1/4W	9T51025-69	
R334	Carbon	56K	1/4W	9T51025-69	
R335	Carbon	22K	1/2W	9T51055-59	
R336	Carbon	56K	1/4W	9T51025-69	
R337	Carbon	56K	1/4W	9T51025-69	
R338	Carbon	22K	1/2W	9T51055-59	
R339	Carbon	56K	1/4W	9T51025-69	
R340	Carbon	56K	1/4W	9T51025-69	
R341	Carbon	22K	1/2W	9T51055-59	
R342	Carbon	56K	1/4W	9T51025-69	
R343	Carbon	56K	1/4W	9T51025-69	
R344	Carbon	22K	1/2W	9T51055-59	
R345	Fusible	100	1/2W	9T52958-51	
R346	Carbon	4.7K	1/6W	9T51014-67	
R347	MetalOxide	270	3W	9T51683-61	
R348	Carbon	10K	1/6W	9T51015-51	
R349	Carbon	10	1/6W	9T51012-51	
R350	Carbon	820K	1/4W	9T51026-73	
R351	Carbon	820K	1/4W	9T51026-73	
R352	Carbon	10K	1/6W	9T51015-51	

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
R353	Carbon	10K	1/6W	9T51015-51	
R354	Fusible	220	1/2W	9T52958-59	
R355	Carbon	150K	1/6W	9T51016-55	
R356	Carbon	1.8K	1/6W	9T51014-57	
R357	MetalOxide	1.5K	1W	9T51664-55	
R358	Carbon	2.7K	1/6W	9T51014-61	
R359	MetalOxide	1.2K	1W	9T51664-53	
R360	Fusible	4.7	1/4W	9T52951-67	
R361	Carbon	1.0K	1/4W	9T51024-51	
R362	Carbon	1.0K	1/4W	9T51024-51	
R363	Carbon	1.0K	1/4W	9T51024-51	
R364	Carbon	1.0K	1/4W	9T51024-51	
R365	Carbon	1.0K	1/6W	9T51014-51	
R366	Carbon	56K	1/4W	9T51025-69	
R367	Carbon	56K	1/4W	9T51025-69	
R368	Carbon	56K	1/4W	9T51025-69	
R369	Carbon	1.0K	1/4W	9T51024-51	
R370	Carbon	1.0K	1/6W	9T51014-51	
R371	Carbon	10K	1/6W	9T51015-51	
R372	Carbon	4.7K	1/6W	9T51014-67	
R373	Carbon	10K	1/6W	9T51015-51	
R374	Carbon	2.2K	1/6W	9T51014-59	
R375	Carbon	330	1/6W	9T51013-63	
R376	Carbon	5.6K	1/6W	9T51014-69	
R377	Carbon	5.6K	1/6W	9T51014-69	
R378	Fusible	10	1/4W	9T52952-51	
R379	Fusible	10	1/4W	9T52952-51	
R380	Carbon	39K	1/6W	9T51015-65	
R381	MetalOxide	100K	2W	9T51676-51	
R382	Carbon	100K	1/6W	9T51016-51	
R383	Carbon	10K	1/6W	9T51015-51	
R384	Carbon	10	1/4W	9T51022-51	
R385	Carbon	4.7K	1/6W	9T51014-67	
R386	Carbon	27K	1/6W	9T51015-61	
R387	Carbon	3.3K	1/6W	9T51014-63	
R388	Carbon	1.0K	1/6W	9T51014-51	
R389	Jumper			2D3580-92	
R390	MetalOxide	330	3W	9T51683-63	
R391	Jumper			2D3580-92	
R392	N/A				
R393	MetalOxide	10	3W	9T51682-51	
R394	Carbon	10	1/2W	9T51052-51	
R401	MetalOxide	1.0	1W	9T51661-51	
R402	Carbon	6.8K	1/6W	9T51014-71	Δ
R403	Carbon	470K	1/6W	9T51016-67	Δ
R404	Carbon	82K	1/6W	9T51015-73	Δ
R405	Carbon	1.0K	1/6W	9T51014-51	
R406	Carbon	1.0K	1/6W	9T51014-51	
R407	Carbon	10K	1/6W	9T51015-51	
R408	Carbon	22	1/6W	9T51012-59	
R409	Carbon	1.5K	1/6W	9T51014-55	
R410	Carbon	1.0K	1/6W	9T51014-51	
R411	Carbon	1.0K	1/6W	9T51014-51	
R412	Carbon	1.0K	1/6W	9T51014-51	
R413	Carbon	1.0K	1/6W	9T51014-51	
R414	Carbon	1.0K	1/6W	9T51014-51	Δ
R415	Carbon	6.8K	1/6W	9T51014-71	Δ
R417	Carbon	1.0K	1/6W	9T51014-51	
R418	Carbon	3.9K	1/6W	9T51014-65	
R419	Carbon	100	1/6W	9T51013-51	
R420	Carbon	47	1/6W	9T51012-67	
R421	N/A				

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
R423	Carbon	68K	1/6W	9T51015-71	⚠
R424	N/A				

<CAPACITOR>

C201	Elect.	100μF	25V	9T64094-50	
C202	Elect.	100μF	25V	9T64094-50	
C203	Elect.	100μF	25V	9T64094-50	
C204	Elect.	100μF	25V	9T64094-50	
C205	Elect.	1000μF	25V	9T64113-50	
C206	Elect.	1000μF	25V	9T64092-00	
C207	Polyester	0.1μF	50V	9T70325-50	
C208	Elect.	22μF	50V	9T64106-50	
C209	Elect.	47μF	50V	9T64086-50	
C210	Polyester	0.68μF	250V	9T77560-02	
C211	Polyester	0.1μF	50V	9T70325-50	
C212	Polyester	0.068μF	100V	9T70373-50	
C213	Ceramic	47PF	50V	9T67220-50	
C301	Elect.	100μF	250V	9T65899-01	
C302	Elect.	47μF	250V	9T64100-00	
C303	Polyester	0.01μF	250V	9T70961-50	
C304	Elect.	1.0μF	250V	9T62204-55	
C305	Polyester	0.47μF	50V	9T70333-00	
C306	Elect.	220μF	50V	9T65880-51	
C307	Elect.	220μF	50V	9T65880-51	
C308	Polyester	6800PF	400V	9T70161-00	
C309	Ceramic	0.1μF	25V	9T69998-50	
C310	Elect.	220μF	50V	9T65880-51	
C311	Elect.	100μF	100V	9T65885-50	
C312	Ceramic	0.1μF	25V	9T69998-50	
C314	Ceramic	0.1μF	25V	9T69998-50	
C315	Polyester	0.01μF	100V	9T70363-50	
C316	Elect.	100μF	100V	9T65885-50	
C317	Ceramic	330PF	1KV	9T68779-51	
C318	Ceramic	330PF	1KV	9T68779-51	
C319	Ceramic	3300PF	1KV	9T67748-51	
C320	Ceramic	2200PF	1KV	9T67747-51	
C321	Polypropylene	2400PF	1.8KV	9T73810-00	
C322	Polypropylene	2400PF	1.8KV	9T73810-00	
C323	Elect.	47μF	16V	9T64109-50	
C325	Ceramic	1500PF	2KV	9T67757-51	
C327	Polypropylene	0.047μF	400V	9T71021-00	
C328	Polypropylene	0.1μF	400V	9T71025-00	
C329	Polypropylene	0.22μF	250V	9T71009-00	
C330	Polypropylene	0.47μF	250V	9T71013-00	
C331	Polypropylene	1.8μF	250V	9T71020-00	
C332	Elect.	1.0μF	250V	9T62204-55	
C333	Polypropylene	0.1μF	400V	9T71025-00	
C334	Elect.	100μF	100V	9T65885-50	
C335	Polyester	0.01μF	250V	9T70961-50	
C336	Polypropylene	0.18μF	250V	9T71008-00	
C337	Elect.	330μF	16V	9T64110-50	
C338	N/A				
C339	BipolarElect.	4.7μF	50V	9T65196-51	
C340	Polyester	4700PF	50V	9T70309-50	
C341	Elect.	100μF	100V	9T65885-50	
C342	Elect.	47μF	16V	9T62049-56	
C343	Polyester	1000PF	50V	9T70301-50	
C344	Ceramic	0.01μF	2KV	9T67773-51	
C345	Ceramic	1000PF	1KV	9T68720-51	
C346	ThinFilm	0.1μF	50V	9T77428-50	
C347	Ceramic	22PF	500V	9T67416-50	
C348	Polyester	1.0μF	100V	9T77525-03	
C349	Jumper			2D3580-92	
C350	Ceramic	1500PF	2KV	9T67757-51	
C351	Elect.	10μF	100V	9T64111-50	
C352	BipolarElect.	2.2μF	50V	9T65194-51	
C353	Polyester	0.1μF	50V	9T70325-50	
C355	Ceramic	220PF	1KV	9T67741-50	
C357	N/A				
C358	Elect.	47μF	16V	9T62049-56	
C359	Elect.	47μF	16V	9T62049-56	
C401	Elect.	47μF	250V	9T64100-00	
C402	Ceramic	470PF	1KV	9T67743-50	
C403	N/A				
C404	Polyester	0.01μF	50V	9T70313-50	
C405	BipolarElect.	10μF	25V	9T65182-51	
C406	Elect.	1000μF	16V	9T62054-56	
C407	Elect.	2.2μF	50V	9T62103-56	
C408	Ceramic	0.1μF	25V	9T69998-50	
C409	Polyester	1000PF	50V	9T70301-50	
C410	Elect.	47μF	16V	9T64109-50	
C411	Polyester	0.015μF	50V	9T70315-50	
C412	N/A				
C413	Ceramic	0.1μF	25V	9T69998-50	
C414	Ceramic	0.1μF	25V	9T69998-50	
C415	Ceramic	0.1μF	25V	9T69998-50	
C416	Ceramic	470PF	1KV	9T67743-50	
C417	Ceramic	330PF	1KV	9T67742-50	
C418	Ceramic	0.1μF	25V	9T69998-50	
C419	Ceramic	0.1μF	25V	9T69998-50	
C420	Elect.	47μF	16V	9T62049-56	
C421	Ceramic	0.1μF	25V	9T69998-50	

<INDUCTOR>

L201	InductorBead	BL02RN1-R62T4	9U16521-50
L202	InductorBead	BL02RN1-R62T4	9U16521-50
L301	MicorInductor	470μH	9U15439-50
L302	MicorInductor	4.7mH	9U15475-50
L303	ChokeCoil	PCL52-01	9U12231-00
L304	LincarityCoil	PCL17-05	9U10375-00
L305	MicorInductor	1.0mH	9U15443-50
L306	MicorInductor	470μH	9U15439-50
L307	ChokeCoil	PCL53-03	9U12263-00
L308	ChokeCoil	PCL52-06	9U12236-00
L309	InductorBead	BL02RN1-R62T4	9U16521-50
L310	InductorBead	BL02RN1-R62T4	9U16521-50
L311	InductorBead	BL02RN1-R62T4	9U16521-50
L312	InductorBead	BL02RN1-R62T4	9U16521-50
L313	InductorBead	BL02RN1-R62T4	9U16521-50
L314	InductorBead	BL02RN1-R62T4	9U16521-50
L315	InductorBead	BL02RN2-R62T4	9U16523-50
L316	MicorInductor	1.0mH	9U15443-50
L317	MicorInductor	470μH	9U15439-50
L318	LincarityCoil	PCL17-04	9U10374-00
L319	InductorBead	BL02RN1-R62T4	9U16521-50
L320	InductorBead	BL02RN1-R62T4	9U16521-50
L321	MicorInductor	470μH	9U15427-50
L322	MicorInductor	470μH	9U15427-50
L323	MicorInductor	470μH	9U15427-50
L401	MicorInductor	470μH	9U15439-50
L402	MicorInductor	470μH	9U15427-50
L403	InductorBead	BL02RN1-R62T4	9U16521-50

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
L404	InductorBead	BL02RN1-R62T4	9U16521-50	
L405	InductorBead	BL02RN1-R62T4	9U16521-50	
L406	MicorInductor	2.2mH	9U15447-50	
L407	MicorInductor	470μH	9U15427-50	
L408	MicorInductor	470μH	9U15427-50	
		<TRANSFORMER>		
T301	DriveTransf.	PTR34-10	9T93640-00	
T302	DynamicFocusTransf.	PTR54-06	9T94626-00	
T402	FlybackTransf.	PCF72-03	9T95493-00	⚠
T403	SRTransf.	PCF73-01	9T95571-00	⚠
		<OTHERS>		
K301	Relay	G5PA-1(C)DC12V	9T91517-00	
K302	Relay	G2R-1ADC12V	9T91536-00	
SG401	SparkGap	DSA-242MA-06	9T92023-00	
SG402	SurgeProtector	DSP-201M-C04F	9T92019-50	
J301	HarnessAssy	PZE74-04	6C80190-00	
P201	Connector	TS-80P-03-V5	9T87408-00	
P301	Connector	B10B-XH-2	9T86644-00	
P302	Connector	B10B-PH-K	9T86609-00	
P303	Connector	B11B-PH-K	9T86610-00	
P304	Connector	B10B-PH-K	9T86609-00	
P305	Connector	27FMN-BTK	9T86841-00	
P306	Connector	27FMN-BTK	9T86841-00	
P307	Connector	TS-80P-04-V5	9T87409-00	
P308	Connector	B3B-PH-K	9T86602-00	
P309	Connector	B3B-XH-2	9T86645-00	
P310	Connector	B3B-XH-2	9T86645-00	
P401	Connector	B2P3-VH-B-C	9T86652-01	
JW301	Jumper		2D3580-08	
JW302	Jumper		2D3580-08	
JW303	Jumper		2D3580-90	
JW304	Jumper		2D3580-94	
JW305	Jumper		2D3580-94	
JW306	Jumper		9T91911-50	
JW307	Jumper		9T91910-50	
JW311	Jumper		2D3580-04	
JW313	Jumper		2D3580-04	
JW401	Jumper		9T91910-50	
JW402	Jumper		9T91910-50	
JW403	Jumper		9T91910-50	
JW404	Jumper		2D3580-04	
FN201	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN202	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN203	HeatSink	HSV105X15X40F102	9V92925-00	
FN301	HeatSink	85X15X70MM4PP=81	9V92816-00	
FN302	ShieldFBT-A	PSM10-563BZ	9U56457-00	
FN303	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN304	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN305	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN306	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN307	HeatSink	17X24X40MM2PP=17.8	9V92822-00	
FN308	227M4-036F1	HEATSINKM4-036F1	9V92803-00	
FN309	227M4-036F1	HEATSINKM4-036F1	9V92803-00	
FN310	227M4-036F1	HEATSINKM4-036F1	9V92803-00	
FN311	HeatSink	105X15X35MM	9V92817-00	
FN401	HeatSink	17X24X40MM2PP=17.8	9V92822-00	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
CA201	CableAssy.	PZE12-32	6C80242-00	
CA301	FBTLeadASSY	PZE74-07	9U29144-00	
CA302		PZE74-08	6C80222-00	
CA303	KRConnectorASSY	PZK13-25	6C89032-00	
CA401	J454ASSY	PZE52-36	9V42-00	
Z301		IS-3PBL	9T92541-00	
Z401		PZE63-02	9Z32411-00	
LB401	Label	PLB01-488	9U33488-00	
MA303	CableClip	NO.2047	9U21230-00	
MA304	WireSaddle	WS-2NS	9U20982-00	
MA305		EDS-1208U	9U21046-00	
MA306	ShieldFBT-B	PSM10-564Z	9U56458-00	
MA307		PST21-13	9U55574-00	

VIDEOBOARD

		<PWB>		
PB002	PWB	PBH178-4	9T13178-04	
		<INTERGRATEDCIRCUIT>		
IC801	IC	M52742SP	9T20013-00	
IC802	IC	CR6927	9T35222-00	
IC803	IC	M35045-057SP-01	9T20033-00	
IC804	IC	M62352FP-70ND	9W98091-50	
IC805	IC	μPC324G2-T1	9W98022-50	
IC806	IC	μPC324G2-T1	9W98022-50	
IC807	IC	μPC7812AHF	9T30036-00	
IC808	IC	μPC7805AHF	9T30053-00	
IC809	IC	μPC7912AHF	9T30052-00	
IC810	IC	STK190-120	9T34433-00	
IC811	N/A			
IC812	IC	μPC358G2-T1	9W98021-50	
IC813	IC	μPC7812AHF	9T30036-00	
		<TRANSISTOR>		
Q801	ChipTransistor	2SC4504E	9W98205-50	
Q802	N/A			
Q803	ChipTransistor	2SC4504E	9W98205-50	
Q804	N/A			
Q805	ChipTransistor	2SC4504E	9W98205-50	
Q806	N/A			
Q807	N/A			
Q808	N/A			
Q809	N/A			
Q810	ChipTransistor	2SD1898T100Q	9W98282-50	
Q811	ChipTransistor	2SB1260T100Q	9W98181-50	
Q812	ChipTransistor	2SD1898T100Q	9W98282-50	
Q813	ChipTransistor	2SB1260T100Q	9W98181-50	
Q814	ChipTransistor	2SD1898T100Q	9W98282-50	
Q815	ChipTransistor	2SB1260T100Q	9W98181-50	
Q816	ChipTransistor	2SD1898T100Q	9W98282-50	
Q817	ChipTransistor	2SB1260T100Q	9W98181-50	
Q818	Transistor	2SC4634-TOK-CBC7	9T42634-00	
Q819	Transistor	2SC4634-TOK-CBC7	9T42634-00	
Q820	ChipTransistor	2SC2412KT146R	9W98201-50	
Q821	ChipTransistor	2SC4412-4/5-TB	9W98204-50	
Q822	ChipTransistor	2SC4412-4/5-TB	9W98204-50	
		<DIODE>		

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
D801	DiodeZener	RD2.2MB	9W98337-50	
D802	DiodeZener	RD2.2MB	9W98337-50	
D803	DiodeZener	RD2.2MB	9W98337-50	
D804	N/A			
D805	Diode	DAN217T146	9W98423-50	
D806	Diode	DAN212KT146	9W98421-50	
D807	Diode	DAN217T146	9W98423-50	
D809	Diode	DAN217T146	9W98423-50	
D811	Diode	DAN212KT146	9W98421-50	
D812	Diode	DAN212KT146	9W98421-50	
D813	Diode	DAN212KT146	9W98421-50	
D814	Diode	DAN217T146	9W98423-50	
D816	Diode	DAN217T146	9W98423-50	
D818	Diode	DAN217T146	9W98423-50	
D820	Diode	DAN212KT146	9W98421-50	
D821	Diode	DAN217T146	9W98423-50	
D823	Diode	DAN217T146	9W98423-50	
D825	Diode	DAN212KT146	9W98421-50	
D826	Diode	DAN212KT146	9W98421-50	
D827	Diode	DAN212KT146	9W98421-50	
D828	Diode	1SS83-TD	9T47202-50	
D829	Diode	1SS83-TD	9T47202-50	
		<VARIABKERESISTOR>		
RV801	VariableResisitor	5.0K	9T509	
RV802	VariableResisitor	5.0K	9T509	
		<RESISTOR>		
R801	JumperChip	0 1/10W	9W99981-50	
R802	JumperChip	0 1/10W	9W99981-50	
R803	JumperChip	0 1/10W	9W99981-50	
R804	Metal	36 1/4W	9T52012-64	
R805	ChipResistor	100K 1/10W ±1%	9W98514-51	
R806	ChipResistor	18K 1/10W ±1%	9W98513-57	
R807	ChipResistor	10 1/10W ±5%	9W98502-51	
R808	ChipResistor	470 1/10W ±1%	9W98511-67	
R809	MetalOxide	390 1W	9T51663-65	
R810	N/A			
R811	ChipResistor	10 1/10W ±5%	9W98502-51	
R812	ChipResistor	470 1/10W ±1%	9W98511-67	
R813	MetalOxide	390 1W	9T51663-65	
R814	N/A			
R815	ChipResistor	10 1/10W ±5%	9W98502-51	
R816	ChipResistor	470 1/10W ±1%	9W98511-67	
R817	MetalOxide	390 1W	9T51663-65	
R818	N/A			
R819	ChipResistor	270 1/10W ±1%	9W98511-61	
R820	ChipResistor	100 1/10W ±1%	9W98511-51	
R821	ChipResistor	2.2K 1/10W ±1%	9W98512-59	
R822	ChipResistor	270 1/10W ±1%	9W98511-61	
R823	ChipResistor	82 1/10W ±1%	9W98510-73	
R824	ChipResistor	2.2K 1/10W ±1%	9W98512-59	
R825	ChipResistor	270 1/10W ±1%	9W98511-61	
R826	ChipResistor	91 1/10W ±1%	9W98510-74	
R827	ChipResistor	2.2K 1/10W ±1%	9W98512-59	
R828	ChipResistor	160K 1/10W ±1%	9W98514-56	
R829	ChipResistor	160K 1/10W ±1%	9W98514-56	
R830	ChipResistor	160K 1/10W ±1%	9W98514-56	
R831	MetalGlaze	220K 1/4W	9T53601-09	
R832	MetalGlaze	220K 1/4W	9T53601-09	
R833	MetalGlaze	220K 1/4W	9T53601-09	
R834	Solid	47 1/4W	9T59169-17	
R835	Solid	47 1/4W	9T59169-17	
R836	Solid	47 1/4W	9T59169-17	
R837	N/A			
R838	N/A			
R839	N/A			
R840	N/A			
R841	N/A			
R842	ChipResistor	8.2K 1/10W ±5%	9W98504-73	
R843	ChipResistor	2.2M 1/10W ±5%	9W98507-59	
R844	ChipResistor	8.2K 1/10W ±5%	9W98504-73	
R845	ChipResistor	2.2M 1/10W ±5%	9W98507-59	
R846	ChipResistor	8.2K 1/10W ±5%	9W98504-73	
R847	ChipResistor	2.2M 1/10W ±5%	9W98507-59	
R848	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R849	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R850	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R851	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R852	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R853	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R854	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R855	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R856	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R857	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R858	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R859	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R860	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R861	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R862	ChipResistor	2.4K 1/10W ±1%	9W98512-60	
R863	ChipResistor	10K 1/10W ±5%	9W98505-51	
R864	ChipResistor	47K 1/10W ±5%	9W98505-67	
R865	ChipResistor	1.2K 1/10W ±5%	9W98504-53	
R866	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R867	ChipResistor	22 1/10W ±5%	9W98502-59	
R868	ChipResistor	22 1/10W ±5%	9W98502-59	
R869	ChipResistor	10 1/10W ±5%	9W98502-51	
R870	ChipResistor	10K 1/10W ±5%	9W98505-51	
R871	ChipResistor	47K 1/10W ±5%	9W98505-67	
R872	ChipResistor	33K 1/10W ±5%	9W98505-63	
R873	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R874	ChipResistor	22 1/10W ±5%	9W98502-59	
R875	ChipResistor	22 1/10W ±5%	9W98502-59	
R876	ChipResistor	10 1/10W ±5%	9W98502-51	
R877	ChipResistor	10K 1/10W ±5%	9W98505-51	
R878	ChipResistor	47K 1/10W ±5%	9W98505-67	
R879	ChipResistor	33K 1/10W ±5%	9W98505-63	
R880	ChipResistor	1.0K 1/10W ±5%	9W98504-51	
R881	ChipResistor	22 1/10W ±5%	9W98502-59	
R882	ChipResistor	22 1/10W ±5%	9W98502-59	
R883	ChipResistor	10 1/10W ±5%	9W98502-51	
R884	ChipResistor	470K 1/10W ±5%	9W98506-67	
R885	ChipResistor	1.0M 1/10W ±5%	9W98507-51	
R886	ChipResistor	470K 1/10W ±5%	9W98506-67	
R887	ChipResistor	470K 1/10W ±5%	9W98506-67	
R888	ChipResistor	470K 1/10W ±5%	9W98506-67	
R889	ChipResistor	470K 1/10W ±5%	9W98506-67	
R890	ChipResistor	10K 1/10W ±5%	9W98505-51	
R891	ChipResistor	10K 1/10W ±5%	9W98505-51	
R892	ChipResistor	22K 1/10W ±5%	9W98505-59	
R893	ChipResistor	270K 1/10W ±5%	9W98506-61	
R894	ChipResistor	47K 1/10W ±5%	9W98505-67	
R895	ChipResistor	100 1/10W ±5%	9W98503-51	
R896	ChipResistor	1.0K 1/10W ±5%	9W98504-51	

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R898	ChipResistor	22 1/10W ±5%	9W98502-59	
R897	ChipResistor	22 1/10W ±5%	9W98502-59	
R899	ChipResistor	10 1/10W ±5%	9W98502-51	
RA801	ChipResistor	2.0K 1/10W ±1%	9W98512-58	
RA802	ChipResistor	2.7K 1/10W ±1%	9W98512-61	
RA803	ChipResistor	1.0K 1/10W ±1%	9W98512-51	
RA804	ChipResistor	18K 1/10W ±1%	9W98513-57	
RA805	ChipResistor	4.7K 1/10W ±1%	9W98512-67	
RA806	ChipResistor	1.0M 1/10W ±1%	9W98515-51	
RA807	ChipResistor	15K 1/10W ±5%	9W98505-55	
RA808	MetalGlaze	1.5M 1/4W	9T53602-55	
RA809	Carbon	47K 1/4W	9T51025-67	
RA810	MetalGlaze	680K 1/2W	9T53604-71	
RA811	MetalGlaze	820K 1/2W	9T53604-73	
RA812	MetalGlaze	680K 1/2W	9T53604-71	
RA813	MetalOxide	68 2W	9T51672-71	
RA814	ChipResistor	47K 1/10W ±5%	9W98505-67	
RA815	ChipResistor	56K 1/10W ±5%	9W98505-69	
RA816	ChipResistor	39K 1/10W ±5%	9W98505-65	
RA817	ChipResistor	10K 1/10W ±5%	9W98505-51	
RA818	ChipResistor	68K 1/10W ±5%	9W98505-71	
RA819	ChipResistor	15K 1/10W ±5%	9W98505-55	
RA820	MetalGlaze	1.0M 1/4W	9T53602-51	
RA821	13A13-47320	47K 1/6W ±5 %	9V51015-67	
RA822	MetalGlaze	1.0M 1/4W	9T53602-51	
RA823	Fusible	5.6K 1/4W	9T52954-69	
RA824	N/A			
RA825	N/A			
RA826	N/A			
RA827	ChipResistor	10K 1/10W ±5%	9W98505-51	
RA828	MetalGlaze	680K 1/2W	9T53604-71	
RA829	ChipResistor	100 1/10W ±1%	9W98511-51	
RA830	ChipResistor	100 1/10W ±1%	9W98511-51	
RA831	ChipResistor	100 1/10W ±1%	9W98511-51	
RA832	MetalOxide	2.21W	9T51661-59	
RA833	Fusible	1.21W	9T52961-53	

<CAPACITOR>

C801	N/A			
C802	ChipCeramic	0.01µF	50V	9W99113-50
C803	N/A			
C804	N/A			
C805	ChipCeramic	0.01µF	50V	9W99113-50
C806	N/A			
C807	N/A			
C808	ChipCeramic	0.01µF	50V	9W99113-50
C809	N/A			
C810	Elect.	47µF	16V	9T64109-50
C811	ChipCeramic	0.1µF	25V	9W99124-50
C812	Elect.	47µF	16V	9T64109-50
C813	ChipCeramic	0.1µF	25V	9W99124-50
C814	Elect.	47µF	16V	9T64109-50
C815	ChipCeramic	0.1µF	25V	9W99124-50
C816	Elect.	47µF	16V	9T64109-50
C817	ChipCeramic	0.1µF	25V	9W99124-50
C818	ChipCeramic	0.1µF	25V	9W99124-50
C819	N/A			
C820	N/A			
C821	N/A			
C822	ChipCeramic	47PF	50V	9W99029-50
C823	ChipCeramic	10PF	50V	9W99013-50
C824	ChipCeramic	47PF	50V	9W99029-50

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
C825	ChipCeramic	10PF	50V	9W99013-50	
C826	ChipCeramic	47PF	50V	9W99029-50	
C827	ChipCeramic	10PF	50V	9W99013-50	
C828	ChipCeramic	56PF	200V	9W99241-50	
C829	ChipCeramic	56PF	200V	9W99241-50	
C830	ChipCeramic	56PF	200V	9W99241-50	
C831	Elect.	10µF	100V	9T64111-50	
C832	Elect.	10µF	100V	9T64111-50	
C833	Elect.	10µF	100V	9T64111-50	
C834	Polyester	0.1µF	100V	9T77513-50	
C835	Elect.	10µF	100V	9T64111-50	
C836	Polyester	0.1µF	250V	9T77550-50	
C837	Polyester	0.1µF	250V	9T77550-50	
C838	Polyester	0.1µF	250V	9T77550-50	
C840	Elect.	1.0µF	250V	9T62204-55	
C841	Ceramic	0.01µF	2KV	9T67773-51	
C842	Ceramic	0.01µF	2KV	9T67773-51	
C843	N/A				
C844	ChipCeramic	4700PF	50V	9W99109-50	
C845	ChipCeramic	0.1µF	25V	9W99124-50	
C846	Elect.	4.7µF	50V	9T62105-56	
C847	ChipCeramic	0.1µF	25V	9W99124-50	
C848	ChipCeramic	1000PF	50V	9W99101-50	
C849	ChipCeramic	0.1µF	25V	9W99124-50	
C850	ChipCeramic	0.1µF	25V	9W99124-50	
C851	ChipCeramic	0.1µF	25V	9W99124-50	
C852	Elect.	100µF	25V	9T62070-56	
C853	Elect.	47µF	25V	9T64101-50	
C854	Elect.	47µF	25V	9T64119-50	
C855	Elect.	47µF	25V	9T64119-50	
C856	Elect.	220µF	6.3V	9T64104-50	
C857	Elect.	47µF	25V	9T64101-50	
C858	Elect.	47µF	16V	9T64109-50	
C859	Elect.	47µF	25V	9T64101-50	
C860	ChipCeramic	100PF	50V	9W99037-50	
C861	ChipCeramic	0.1µF	25V	9W99124-50	
C862	Elect.	10µF	25V	9T62066-56	
C863	Elect.	10µF	25V	9T62066-56	
C864	Elect.	220µF	35V	9T64121-50	
C865	Elect.	220µF	16V	9T64043-50	
C866	Ceramic	0.1µF	50V	9T69976-50	
C867	ChipCeramic	0.1µF	25V	9W99092-50	
C868	Ceramic	0.1µF	50V	9T69976-50	
C870	Ceramic	0.1µF	50V	9T69976-50	
C872	Elect.	1.0µF	250V	9T62204-55	
C873	Elect.	1.0µF	250V	9T62204-55	
C874	Elect.	1.0µF	250V	9T62204-55	
C875	ChipCeramic	0.1µF	25V	9W99092-50	
C876	ChipCeramic	0.1µF	25V	9W99092-50	
C877	ChipCeramic	0.1µF	25V	9W99092-50	
C878	ChipCeramic	0.1µF	25V	9W99092-50	
C879	ChipCeramic	0.1µF	25V	9W99092-50	
C880	ChipCeramic	0.1µF	25V	9W99092-50	
C881	ChipCeramic	0.1µF	25V	9W99092-50	
C882	Polyester	0.1µF	100V	9T77513-50	
C883	Polyester	0.1µF	100V	9T77513-50	
C884	Polyester	0.1µF	100V	9T77513-50	
C885	N/A				
C886	N/A				
C887	N/A				
C888	ChipCeramic	0.1µF	25V	9W99124-50	
C889	N/A				

The components identified by Δ are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
C890	ChipCeramic	0.1μF	25V	9W99124-50	
C891	N/A				
C892	ChipCeramic	0.1μF	25V	9W99124-50	
C893	N/A				
C894	Elect.	47μF	25V	9T64101-50	
C895	Elect.	47μF	16V	9T64109-50	
C896	Ceramic	220PF	50V	9T69953-50	
C897	Ceramic	220PF	50V	9T69953-50	
C898	Ceramic	220PF	50V	9T69953-50	
CB801	Ceramic	0.1μF	50V	9T69976-50	
CB803	Ceramic	0.1μF	50V	9T69976-50	
		<INDUCTOR>			
L801	MicorInductor	100μH		9U15431-50	
L802	InductorBead	BL02RN2-R62T4		9U16523-50	
L803	InductorBead	BL02RN2-R62T4		9U16523-50	
L804	InductorBead	BL02RN2-R62T4		9U16523-50	
L805	MicorInductor	100μH		9U15333-51	
L806	InductorBead	BL02RN2-R62T4		9U16523-50	
L807	InductorBead	BL02RN2-R62T4		9U16523-50	
L808	InductorBead	BL02RN2-R62T4		9U16523-50	
L809	MicorInductor	10μH		9U15321-51	
L813	ChipInductor	BLM21A121SPT		9W99704-50	
L814	ChipInductor	BLM21A121SPT		9W99704-50	
L815	ChipInductor	BLM21A121SPT		9W99704-50	
		<OTHERS>			
SG801	SurgeProtector	DSP-301N-C04F		9T92020-50	
SG802	SurgeProtector	DSP-301N-C04F		9T92020-50	
SG803	SurgeProtector	DSP-201M-C04F		9T92019-50	
SG804	SparkGap	AG15PC152FB-K2M		9T92016-50	
SG805	SurgeProtector	DSP-301N-C04F		9T92020-50	
P801	Connector	B6B-XH-2		9T86649-00	
P802	Connector	18FMN-STRK		9T86839-00	
P803	Connector	B2P3-VH-B-CBlack		9T86652-01	
P804	Connector	B9B-XH-2		9T86651-00	
P805	BasePin	005P-3200		9T87311-00	
P806	Connector	B2B-PH-K-SWhite		9T86641-00	
P807	Connector	008263031200003		9T87503-03	
P808	Connector	B3B-EH		9T86273-00	
P809	Connector	B2B-PH-K		9T86601-00	
JW801	JumperChip	0Ω	1/10W	9W99981-50	
JW802	ChipCeramic	0.1μF	25V	9W99124-50	
JW803	JW803ASSY	PZE85-11		6C80230-00	
JW820	JumperChip	0Ω	1/10W	9W99981-50	
JW821	JumperChip	0Ω	1/10W	9W99981-50	
JW822	JumperChip	0Ω	1/10W	9W99981-50	
JW823	JumperChip	0Ω	1/10W	9W99981-50	
JW824	JumperChip	0Ω	1/10W	9W99981-50	
JW825	JumperChip	0Ω	1/10W	9W99981-50	
JW826	JumperChip	0Ω	1/10W	9W99981-50	
JW827	N/A				
JW830	N/A				
JW831	N/A				
JW833	JumperChip	0Ω	1/10W	9W99981-50	
JW834	Jumper			2D3580-92	
JW836	Jumper			2D3580-92	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
JW837	Jumper		2D3580-92	
JW838	Jumper		2D3580-90	
JW839	Jumper		2D3580-93	
JW840	Jumper		2D3580-90	
JW841	Jumper		2D3580-90	
JW842	Jumper		2D3580-04	
JW843	Jumper		2D3580-92	
FN801	HeatSinkV	PSM10-506BZ	9U56420-02	
FN802	22711-15250	PC1115-25-TA	9V92923-00	
S801	CRTSocket	B10-301SM	9V89002-00	
Z801	GroundTerminal	TP00383-41	9T88955-50	
Z802	GroundTerminal	TP00383-41	9T88955-50	
Z803	GroundTerminal	TP00383-41	9T88955-50	
Z804	GroundTerminal	TP00383-41	9T88955-50	
Z805	WireSaddle	WS-2NS	9U20982-00	
MA801	ShieldVA	PSM10-560AZ	9U56460-00	
MA802	ShieldVB	PSM10-561AZ	9U56461-00	
MA803	Cussion	PSM10-568	9U56463-00	
		<INTERFACEBOARDUNIT>		
PB003	Unit	IF4-A10	9T19244-00	
		<SWITCHING POWER SUPPLY BOARD>		
		<PWB>		
PB004	PWB	PBH179-3	9T13179-03	
		<INTERGRATEDCIRCUIT>		
IC901	IC	MIP0222SY	9T35032-00	
IC902	IC	STR-S6709A(LF953)	9T33223-00	
IC951	IC	SI-3050C	9T33243-00	
IC952	IC	SE140N-LF4	9T33202-00	
IC953	IC	SI-8050S	9T33258-00	
IC954	IC	TL431CLPB	9T33404-00	
		<TRANSISITOR>		
Q901	Transistor	2SD1312-L/K-T	9T44250-50	Δ
Q902	Transistor	2SC2458-Y-TPE4	9T42396-50	Δ
Q951	Transistor	2SC2458-Y-TPE4	9T42396-50	
Q952	Transistor	2SC2458-Y-TPE4	9T42396-50	Δ
Q953	Transistor	2SC2458-Y-TPE4	9T42396-50	
Q954	N/A			
Q955	Transistor	2SA1679(TP5T4)	9T42346-00	
Q956	Transistor	2SC4266-T11-Q1R	9T42566-50	
Q957	Transistor	2SC4148(TP7S4)	9T42554-00	
Q958	Transistor	2SA1995-T12-Q/R	9T40375-50	
Q959	Transistor	2SC4953	9T42653-00	
		<DIODE>		
D901	DiodeBridge	D5SB60-4101	9T47374-00	
D902	Diode	EM2ALF-F4	9T47055-00	
D903	Diode	EG01-V0	9T47246-50	
D904	Diode	FMU-G16S	9T47143-00	
D905	Diode	EG01C-V0	9T47164-50	
D906	Diode	ERA91-02V3	9T47093-50	
D907	Diode	EG01C-V0	9T47164-50	
D908	Diode	RD6.8EB2-TA1IR)	9V46047-50	

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
D909	Diode	ERA91-02V3	9T47093-50	
D910	Diode	ERA91-02V3	9T47093-50	
D911	Diode	AK04V0	9T47229-50	
D912	DiodeZener	RD18FB222M	9T46388-01	
D913	Diode	EG01-V0	9T47246-50	
D914	DiodeZener	RD18FB222M	9T46388-01	
D915	Diode	1JH46-TPA3	9T47174-50	
D951	Diode	SF5LC20U	9T47052-00	
D952	Diode	ERA15-01V3	9T47086-50	
D953	Diode	RD3.6EB2-TA11R(9T)	9V46021-50	
D954	Jumper	0.58Ø(P=5‡o)	2D3580-92	
D955	Diode	ERA15-01V3	9T47086-50	
D956	Diode	ERA15-01V3	9T47086-50	
D957	Diode	RU4CLF015-308	9T47192-04	
D958	N/A			
D959	DiodeZener	RD27EB2-TA11R	9T46107-50	⚠
D960	DiodeZener	RD27EB2-TA11R	9T46107-50	⚠
D961	Diode	RU3AMLF-C4	9T47173-01	
D962	Diode	YG902C2R	9T47279-00	
D963	N/A			
D964	Diode	ERB93-02L6	9T47089-00	
D965	Diode	ERA15-06V3	9T47087-50	
D966	Diode	RK36LF-A1	9T47273-00	
D967	Diode	ERA15-01V3	9T47086-50	
D968	DiodeZener	RD7.5FB2-22M	9T46351-01	
D969	DiodeZener	RD6.8EB2-TA11R	9T46047-50	

<PHOTOCOUPLER>

PH901	PhotoCoupler	PC123FY2	9T49152-00
PH902	PhotoCoupler	PC123FY2	9T49152-00
PH903	PhotoCoupler	S12ME1FY	9T49200-00
PH904	PhotoCoupler	PC123FY2	9T49152-00

<RESISTOR>

R901	MetalGlaze	680K	1/2W	9T53604-71
R902	ResistorCement	3.9	5W	9T52559-15
R903	ResistorCement	3.9	5W	9T59579-00
R904	ResistorCement	1.0	10W	9T59575-00
R905	Fusible	18	1/4W	9T52952-57
R906	Carbon	6.8	1/6W	9T51011-71
R907	MetalOxide	100K	3W	9T51686-51
R908	MetalOxide	100K	3W	9T51686-51
R909	MetalOxide	68K	2W	9T51675-71
R910	MetalOxide	68K	2W	9T51675-71
R911	Fusible	0.1	1/4W	9T59710-50
R912	Fusible	0.1	1/4W	9T59710-50
R913	Fusible	47	1/4W	9T52952-67
R914	Carbon	10K	1/2W	9T51055-51
R915	Carbon	1.8K	1/4W	9T51024-57
R916	Carbon	1.0K	1/6W	9T51014-51
R917	Carbon	1.0K	1/6W	9T51014-51
R918	Carbon	27K	1/6W	9T51015-61
R919	Carbon	4.7K	1/6W	9T51014-67
R920	Carbon	22K	1/6W	9T51015-59
R921	Carbon	2.2K	1/6W	9T51014-59
R922	MetalOxide	10	3W	9T51682-51
R923	MetalOxide	0.47	1W	9T51660-67
R924	Carbon	6.8K	1/4W	9T51024-71
R925	ResistorCement	0.15	3W	9T52555-05
R926	Carbon	100	1/4W	9T51023-51
R927	MetalOxide	100K	2W	9T51676-51
R928	Carbon	180	1/6W	9T51013-57

REF. NO.	PARTS NAME	DESCRIPTIONS		CODE NO.	REMARKS
R951	Carbon	560	1/4W	9T51023-69	
R952	Carbon	15K	1/6W	9T51015-55	
R953	Carbon	3.3K	1/6W	9T51014-63	
R954	Carbon	33	1/2W	9T51052-63	
R955	Carbon	47K	1/6W	9T51015-67	
R956	Carbon	100	1/6W	9T51013-51	
R957	Fusible	0.82	1/2W	9T59713-51	
R958	MetalOxide	5.6	2W	9T51671-69	
R959	MetalOxide	5.6	2W	9T51671-69	
R960	Carbon	330	1/4W	9T51023-63	
R961	Metal	1.8K	1/6W	9T52004-57	
R962	Metal			9V52003-69	
R963	Fusible	0.1	1/4W	9T59710-50	
R964	Fusible	0.1	1/4W	9T59710-50	
R965	N/A				
R966	N/A				
R967	Carbon	8.2K	1/4W	9T51024-73	
R968	Carbon	560	1/6W	9T51013-69	
R969	Metal	1.2K	1/6W	9T52004-53	
R970	Carbon	47K	1/4W	9V52015-67	
R971	Carbon	2.4K	1/4W	9V52014-60	
R972	Fusible	0.1	1/4W	9T59710-50	
R973	Fusible	120	1/4W	9T52953-53	
R974	Metal	100	1/6W	9T52003-51	
R975	Carbon	1.0K	1/2W	9T51054-51	
R976	Carbon	10K	1/6W	9T51015-51	
R977	Carbon	10K	1/6W	9T51015-51	
R978	Carbon	3.3K	1/2W	9T51054-63	
R979	Carbon	10K	1/6W	9T51015-51	
R980	Carbon	100	1/6W	9T51013-51	
R981	Metal	1.5K	1/6W	9T52004-55	
R982	Carbon	150	1/6W	9T51013-55	
R983	Carbon	270	1/6W	9T51013-61	
R984	Metal	6.8K	1/6W	9T52004-71	
R985	Metal	3.6K	1/6W	9T52004-64	
R986	Carbon	3.3K	1/6W	9T51014-63	
R987	Carbon	15K	1/6W	9T51015-55	
TH901	Posistor 9Ω 270V	PTH451A300BF9R0Q270		9T48816-00	

<CAPACITOR>

C902	Polypropylene	0.1µF	275V	9T79127-00
C903	Polypropylene	0.47µF	450V	9T79147-00
C904	Polyester	0.47µF	450V	9T79151-00
C905	Elect.	560µF	400V	9T64099-00
C906	Polyester	0.47µF	400V	9T77595-02
C907	Polyester	0.015µF	630V	9T77606-50
C908	Elect.	47µF	25V	9T64101-50
C909	Ceramic	0.1µF	25V	9T69998-50
C910	Polyester	0.1µF	50V	9T70325-50
C911	Polyester	0.033µF	630V	9T77610-50
C912	Elect.	47µF	63V	9T64122-50
C913	Elect.	220µF	25V	9T64044-50
C914	Elect.	120µF	35V	9T64069-51
C915	Polyester	1000PF	50V	9T70301-50
C916	Polyester	1000PF	50V	9T70301-50
C917	Polyester	0.1µF	50V	9T70325-50
C918	Elect.	220µF	25V	9T64023-51
C919	Polypropylene	1500PF	1.2KV	9T73207-00
C920	N/A			
C921	N/A			

The components identified by ⚠ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
C951	Elect.	1200µF 16V	9T64045-51	
C952	Elect.	680µF 16V	9T65875-51	
C953	Elect.	220µF 16V	9T64043-50	
C954	Elect.	470µF 10V	9V62033-65	
C955	Elect.	100µF 10V	9T64102-50	
C956	Elect.	150µF 250V	9T64089-01	
C957	Elect.	100µF 250V	9T64089-00	
C958	Elect.	1000µF 6.3V	9T64103-50	
C959	Elect.	220µF 6.3V	9T64104-50	
C960	Elect.	220µF 100V	9T65928-00	
C961	Elect.	100µF 100V	9T65885-50	
C962	Elect.		9V60017-00	
C963	Elect.	1000µF 25V	9T64049-01	
C965	Elect.	1000µF 25V	9T64049-01	
C966	Elect.		9T64006-51	
C967	Elect.	33µF 250V	9T64105-50	
C968	Elect.	100µF 10V	9T62030-56	
C969	Elect.	1000µF 25V	9T64049-01	
C970	Elect.	1000µF 25V	9T64049-01	
C972	Polyester	0.1µF 50V	9T70325-50	
		<INDUCTOR>		
L901	LineFilter	SS28V-R20130	9U14670-00	
L902	Inductor	SN10-500J	9U14672-00	
L903	InductorBead	BL02RN2-R62T4	9U16523-50	
L904	InductorBead	BL02RN1-R62T4	9U16521-50	
L951	MicorInductor	15µH	9U5409-50	
L952	InductorBead	BL02RN2-R62T4	9U16523-50	
L953	MicorInductor	15µH	9U5409-50	
L954	MicorInductor	15µH	9U5409-50	
L955	MicorInductor	10µH	9U15486-50	
L956	MicorInductor	15µH	9U5409-50	
L958	Inductor	SN10-500J	9U14672-00	
L960	InductorBead	BL02RN2-R62T4	9U16523-50	
		<TRANSFORMER>		
T901	SwitchingTransf.	PTR68-01	9T94971-00	
T902	SwitchingTransf.	PTR62-03	9T94758-00	
T903	SwitchingTransf.	PTR66-08	9T94938-00	
		<OTHERS>		
K901	Relay	FTR-F1CA006V	9T91510-00	
F901	321T6-32150	FUSE215005(9T)	9V91198-00	
FH901	FuseHolder	TP00351-51	9T90970-50	
P901	Connector	B2P3-VH-B	9T86652-00	
P902	Connector	B2P3-VH-B-CBlack	9T86652-01	
P951	Connector	B10B-PH-K	9T86609-00	
P952	Connector	B10B-XH-2	9T86644-00	
P953	Connector	B9B-XH-2	9T86651-00	
P954	Connector	B3B-XH-2	9T86645-00	
JW903	Jumper	0.58Ø(P=15‡o)	2D3580-91	
JW904	Jumper	0.58Ø(P=10‡o)	2D3580-04	
JW905	Jumper	0.58Ø(P=7.5‡o)	2D3580-93	
JW907	Jumper	0.58Ø(P=10)	2D3580-04	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
JW909	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW910	Jumper	0.58Ø(P=10)	2D3580-04	
JW911	Jumper	0.58Ø(P=10)	2D3580-04	
JW912	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW913	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW914	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW915	Jumper	0.58Ø(P=10)	2D3580-04	
JW918	Jumper	0.58Ø(P=17.5)	2D3580-94	
JW919	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW920	Jumper	0.58Ø(P=15)	2D3580-91	
JW921	Jumper	0.58Ø(P=15)	2D3580-91	
JW924	Jumper	0.58Ø(P=15)	2D3580-91	
JW925	Jumper	0.58Ø(P=10)	2D3580-04	
JW926	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW930	Jumper	0.58Ø(P=10)	2D3580-04	
JW951	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW952	Jumper	0.58Ø(P=10)	2D3580-04	
JW953	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW954	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW958	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW959	Jumper	0.58Ø(P=15)	2D3580-91	
JW960	Ferrite Bead	RHCORESBF45TA3.5X4.5X0.8	9U5002-50	
JW962	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW963	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW965	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW966	Jumper	0.58Ø(P=10)	2D3580-04	
JW967	Jumper	0.58Ø(P=15)	2D3580-91	
JW968	Jumper	0.58Ø(P=20)	2D3580-08	
JW969	Jumper	0.58Ø(P=15)	2D3580-91	
JW970	Jumper	0.58Ø(P=15)	2D3580-91	
JW971	Jumper	0.58ØPT-20	2D3580-08	
JW972	Jumper	0.58Ø(P=10)	2D3580-04	
JW973	Jumper	0.58Ø(P=12.5)	2D3580-90	
JW974	Jumper	0.58Ø(P=7.5)	2D3580-93	
JW975	Jumper	0.58Ø(P=12.5)	2D3580-90	
FN901	HeatSinkDS	PSM10-514AZ	9U56423-01	
FN902	HeatSink	PC1115-25-TA	9V92923-00	
FN904	HeatSink	PC1115-25-TA	9V92923-00	
FN905	HeatSink	16X17X25MM2PP=10	9V92818-00	
FN906	HeatSink	M4-059F0	9V92804-00	
FN907	HeatSink	M4-059F0	9V92804-00	
SW901	PowerSwitch	ESB92S21B	9T90377-00	
CA901	N/A			
CA902	GNDASSY	PZE42-49	9V53-00	
CA903	ACCableASSY	PZE85-03	9V68-00	
CA904	N/A			
CA905	N/A			
Z901	Eyelet	2.0 ~3.0 ~3.3	9T91992-00	
Z902	Eyelet	1.6 ~3.0 ~3.0	9T91991-00	
Z903	Tube	85T-Ø20-38L(10 ~22)	9Z32437-00	
Z904	WireSaddle	WS-2NS	9U20982-00	
MA901	HolderTR	PHD12-05	9U55980-00	

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<USB BOARD>

<PWB>

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
PB005	PWB	PBH180-3	9T13180-03	

<INTERGRATEDCIRCUIT>

IC501	IC	PDIUSBH11ANB	9T35224-00	
IC502	MicroController	PMC65-02(MASK)	9T36652-00	
IC503	IC	UCC38531	9T35202-00	

<DIODE>

D501	Diode	ERA15-01V3	9T47086-50	
D502	Diode	DAN217T146	9W98423-50	
D503	Diode	DAN217T146	9W98423-50	
D504	Diode	DAN217T146	9W98423-50	
D505	Diode	DAN217T146	9W98423-50	
D506	Diode	DAN217T146	9W98423-50	
D507	Diode	DAN217T146	9W98423-50	
D508	Diode	DAN217T146	9W98423-50	
D509	Diode	DAN217T146	9W98423-50	
D510	Diode	DAN217T146	9W98423-50	
D511	Diode	DAN217T146	9W98423-50	

<RESISTOR>

R502	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R503	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R504	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R505	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R506	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R507	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R508	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R509	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R510	ChipResistor	10K	1/10W ±5%	9W98505-51	
R511	ChipResistor	10K	1/10W ±5%	9W98505-51	
R512	ChipResistor	10K	1/10W ±5%	9W98505-51	
R513	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R514	ChipResistor	3.3K	1/10W ±5%	9W98504-63	
R515	ChipResistor	3.3K	1/10W ±5%	9W98504-63	
R516	ChipResistor	4.7K	1/10W ±5%	9W98504-67	
R517	ChipResistor	8.2K	1/10W ±5%	9W98504-73	
R518	ChipResistor	1.0M	1/10W ±5%	9W98507-51	
R521	ChipResistor	1.0K	1/10W ±5%	9W98504-51	
R522	ChipResistor	1.0M	1/10W ±5%	9W98507-51	
R523	ChipResistor	10K	1/10W ±5%	9W98505-51	
R524	ChipResistor	24	1/8W ±5%	9W98808-60	
R525	ChipResistor	24	1/8W ±5%	9W98808-60	
R526	ChipResistor	24	1/8W ±5%	9W98808-60	
R527	ChipResistor	24	1/8W ±5%	9W98808-60	
R528	ChipResistor	24	1/8W ±5%	9W98808-60	
R529	ChipResistor	24	1/8W ±5%	9W98808-60	
R530	ChipResistor	24	1/8W ±5%	9W98808-60	
R531	ChipResistor	24	1/8W ±5%	9W98808-60	
R532	ChipResistor	24	1/8W ±5%	9W98808-60	
R533	ChipResistor	24	1/8W ±5%	9W98808-60	
R534	ChipResistor	10K	1/10W ±5%	9W98505-51	
R535	ChipResistor	10K	1/10W ±5%	9W98505-51	
R536	ChipResistor	10K	1/10W ±5%	9W98505-51	
R537	ChipResistor	10K	1/10W ±5%	9W98505-51	
R538	ChipResistor	330	1/10W ±5%	9W98503-63	
R539	ChipResistor	330	1/10W ±5%	9W98503-63	
R540	ChipResistor	330	1/10W ±5%	9W98503-63	

<CAPACITOR>

C501	Elect.	100µF	16V	9T64064-50
C502	Elect.	10µF	25V	9T64062-50
C503	Elect.	10µF	25V	9T64062-50
C504	ChipCeramic	0.1µF	25V	9W99124-50
C505	ChipCeramic	0.1µF	25V	9W99124-50
C506	ChipCeramic	22PF	50V	9W99021-50
C507	ChipCeramic	22PF	50V	9W99021-50
C508	ChipCeramic	22PF	50V	9W99021-50
C509	ChipCeramic	22PF	50V	9W99021-50
C511	ChipCeramic	0.1µF	25V	9W99124-50
C512	ChipCeramic	0.1µF	25V	9W99124-50
C513	Elect.	10µF	25V	9T64062-50
C514	Elect.	10µF	25V	9T64062-50
C515	Elect.	100µF	16V	9T64064-50
C516	Elect.	100µF	16V	9T64064-50
C517	Elect.	100µF	16V	9T64064-50
C518	Elect.	100µF	16V	9T64064-50
C520	ChipCeramic	0.1µF	25V	9W99124-50
C521	ChipCeramic	0.1µF	25V	9W99124-50
C522	ChipCeramic	0.1µF	25V	9W99124-50
C523	ChipCeramic	0.1µF	25V	9W99124-50
C524	ChipCeramic	0.1µF	25V	9W99124-50
C525	Ceramic	0.1µF	50V	9T69976-50
C526	Ceramic	0.1µF	50V	9T69976-50
C527	Ceramic	0.1µF	50V	9T69976-50

<INDUCTOR>

L501	JumperChip	RK73Z2ATD		9W99981-50
L504	ChipInductor	BLM31P121SGPT		9W99703-50
L505	ChipInductor	BLM31P121SGPT		9W99703-50
L506	ChipInductor	BLM31P121SGPT		9W99703-50
L507	ChipInductor	BLM31P121SGPT		9W99703-50
L508	ChipInductor	BLM31P121SGPT		9W99703-50
L509	ChipInductor	BLM21A121SPT		9W99704-50
L510	ChipInductor	BLM21A121SPT		9W99704-50
L511	ChipInductor	BLM21A121SPT		9W99704-50
L512	ChipInductor	BLM21A121SPT		9W99704-50
L513	ChipInductor	BLM21A121SPT		9W99704-50
L514	ChipInductor	BLM31P121SGPT		9W99703-50
L515	ChipInductor	BLM21A121SPT		9W99704-50
L516	ChipInductor	BLM21A121SPT		9W99704-50
L517	ChipInductor	BLM31P121SGPT		9W99703-50
L518	ChipInductor	BLM31P121SGPT		9W99703-50

<OTHERS>

P501	Connector	B8B-PH-K		9T86607-00
P502	Connector	B3B-XH-2		9T86645-00
P503	USBSocket	CSS5104-0211		9T87287-00
P504	USBSocket	CSS5104-0211		9T87287-00
X501	CristalOscilator	HC-49/U-S12MHZ		9T92989-00
X502	CristalOscilator	HC-49/U-S12MHZ		9T92989-00
Z501	GroundTerminal	TP00383-41		9T88955-50
Z502	GroundTerminal	TP00383-41		9T88955-50
MA501	ShieldUSB-A	PSM10-577Z		9U56465-00
MA502	ShieldUSB-B	PSM10-578Z		9U56466-00
MA503	InsulatorUSB	PSM10-579		9U21701-00

The components identified by Δ are critical for safety. Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
		<SWITCHI BOARD>		
		<PWB>		
PB006	PWB	PBH071-0	9T13071-00	
		<DIODE>		
D703	LED	SML16716CNTP4-D1,D3	9T48435-50	
		<RESISTOR>		
R701	Carbon	330 1/2W ±5%	9V51053-63	
R702	Carbon	1.5K 1/4W ±5%	9V51024-55	
R703	Carbon	10K 1/4W ±5%	9V51115-51	
R704	Carbon	10K 1/4W ±5%	9V51115-51	
		<OTHERS>		
P703	Connector	S10B-PH-K	9T86623-00	
SW701	TactSwitch	SKHVPPD010	9T90364-50	
SW702	TactSwitch	SKHVPPD010	9T90364-50	
SW703	TactSwitch	SKHVPPD010	9T90364-50	
SW704	TactSwitch	SKHVPPD010	9T90364-50	
CA701	KRConnectorASSY	PZK10-50	6C89105-00	
CA702	GND-ASSY		6C88950-00	
L001	Coil	PCL01-68	8F81447-00	
		<Others>		
CA001	LineFilter	SUP-L3G-E-3	9U16554-00	
CA003	GNDASSY	PZE42-37	9V33-00	
CA004	ACCable	PZE34-00(UL/CSA)	9V22-00	
CA005	ACCable	PZE11-125	9U23436-00	
CA006	SignalCable	PZE25-01(DOS/V)	9V26-00	
CA007	USBCable	PZE29-01	9V70-00	
CA008	USBJoitCable	PZE73-32	6C80228-00	
CA009	USBPowerCable	PZE73-31	6C80226-00	
CA010	CableAssy.	PZE12-91	6C80212-00	
CA011	CoaxialCableAssy.	PZE12-60	6C80210-00	
CA012	CableAssy.	PZE12-02	6C80206-00	
CA013	CRTGNDASSY	PZE43-05	6C80194-00	
CA014	USBJoitCable	PZE19-07	6D80399-00	
CA015	Coil	PZE13-30	6C80142-00	
CA016	GNDASSY1	PZE42-13B	9V37-00	
		<CAPACITOR CHANGE BOARD>		
		<PWB>		
PB007	PWB	PBH231-1	9T13231-01	
		<MOSFET>		
Q301	FET	2SK1986-01F19	9T45096-00	
		<DIODE>		
D301	Diode	1SS83-TD	9T47202-50	
D302	DiodeZener	RD15EB2-TA11R	9T46080-50	
		<RESISITOR>		
R301	Carbon	10K 1/6W	9T51015-51	
R302	Carbon	100 1/6W	9T51013-51	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
		<CAPACITOR>		
C301	Elect.	47μF 16V	9T62049-56	
C302	Ceramic	680PF 2KV	9T67755-51	
C303	Ceramic	330PF 2KV	9T67753-51	
		<INDUCTOR>		
L301	Jumper	0.58Ø(P=5mm)	2D3580-92	
L302	InductorBead	BL02RN1-R62T4	9U16521-50	
		<OTHRES>		
P301	Connector	B3B-PH-K	9T86602-00	
P302	Connector	TS-80P-03-V5	9T87408-00	
FN301	HeatSink	PH-0125-S	9T92960-00	
		<MAIN BODY>		
CA021	KRConnectorASSY	PZK10-40	6C89104-00	
CA022	InsulationTube	AWG3/8AH-6VW	9Z31113-51	
CA023	ACCabole(SCHUKO)	PZE33-06	9V87-00	
W001	F.F.C	TFL-100K-27-150	3A85271-00	
W002	F.F.C	TFL-100R-18-100	3A85181-00	
V001	CRT 21'	M51LLB673X11	9T3802-00	Δ
DG001	DegaussingCoil	PCL62-15	8F81454-00	
Z001	HVCableHolder	3-704-372-01	9W70404-00	
Z003	SKBinder	SKB-100	9U21180-00	
Z004		NO.61	9U21242-00	
Z005		NO.166	9U20436-00	
Z006	WireSaddle	WS-2NS	9U20982-00	
Z007	WireSaddle	EDS-1208U	9U21046-00	
Z009	Connector	A-MAC1150003	9U93511-00	
Z010	FerriteCore	MSFC-8KEA	9T97942-00	
Z011	Contact	PSM31-01	9U56211-00	
Z012	F.F.C	1CX60mm	3A85431-00	
Z013	F.F.C	1CX260mm	3A85432-00	
Z014		TY-232M	9U21177-00	
Z015		MSFC4EX	9T97944-00	
Z020	FerriteCore	MTFC16813	9T97943-00	
Z021	Gasket	EMC-60-40-MST	9U20933-00	
LB001	Label		9U31216-03	
LB002	Label		9U31221-00	
LB003	Label	PLB01-461A	9U31791-50	
LB003	Label	PLB01-461B	9U31791-51	
LB003	Label	PLB01-461C	9U31791-52	
LB004	Label	PLB07-731	9U32731-50	
LB005	Label	PLB01-247	9U31547-00	
LB006	Label	PLB26-01	9U31226-00	
LB007	Label	PLB51-01	9U31251-00	
LB008	Label	PLB52-33	9U31252-33	
LB009	Label	PLB05-13	9U93502-00	
LB013	Label	PLB07-730	9U32730-00	

The components identified by ⚠ are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
LB014	Label	PLB01-489	9U33489-00	
LB015	Label	PLB07-721	9U32721-00	
LB016	Label	PLB07-722	9U32722-00	
LB017	Label	PLB07-723	9U32723-00	
		<Mechanical Parts>		
MA001	ShieldD	PZM10-1185AZ	9U70445-01	
MA002	CRTShieldASSY	PZM10-1184DZ	9U70448-01	
MA003	PanelCN	PPA21-16AZ	9U75122-00	
MA004	BlacketD	PMM20-10B	9U69055-01	
MA005	InsulatorAC	PSM10-562	9U21700-00	
MA006	Spling	PSM10-368	9U59310-00	
MA007	Screw5	4-365-808-01	9W36503-00	
MA008	Screw	4~10FW 9Z3689-01		
MA009	Screw	4~16F-NI	9Z3682-00	
MA010	Screw	PZM10-1028A(M4~12)	9Z3999-01	
MA011	ShieldC	PZM10-1177BZ	9U70442-00	
MA012	ShieldR	PZM10-1178BZ	9U70443-00	
MA013	ShieldL	PZM10-1179BZ	9U70444-00	
MA014	ContactDY	PSM10-566	9U56462-00	
MA015	Clamper	PMM45-11	9U69067-00	
MA016	Wacher	6.5~16~1.6F-ZNC	9Z5406-00	
		<Mold Parts>		
MH001	BezelASSY	PBE21-32	9U62078-00	
MH002	PlateR	PMM57-36	9U69160-00	
MH003	PlateL	PMM57-37	9U69161-00	
MH004	Cover	PCO21-13	9U61033-00	
MH005	CoverConnector	PMM20-18A	9U69061-00	
MH006	StandASSY	PMM20-19C	9U69062-03	
MH007	SpacerPS	PMM52-67	9U69162-00	
MP001	Owner'sGuide	PZZ11-483A	9U40483-01	
MP003	CautionTCO99		9U40533-00	
MP006	Anti-StaticBag	3-701-625-01	9W70115-00	
MP007	Box	PZP23-98B	9U84307-02	
MP008	CussionTop	PZP33-58	9U84277-00	
MP009	CussionBottom	PZP33-59	9U84278-00	
MP010	Anti-StaticBag	PZM92-11	9U49238-00	
MP011	INFCD	AMULTIMEDIACD-ROM 9U93569-00		

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS

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